



A Lake Dwelling in Its Landscape

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A Lake Dwelling in Its
Landscape. Iron Age
Settlement at Culter
Loch, Castle Kennedy,
Dumfries**

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A LAKE DWELLING IN ITS LANDSCAPE

*Iron Age settlement at Cults Loch,
Castle Kennedy, Dumfries & Galloway*



GRAEME CAVERS & ANNE CRONE

A LAKE DWELLING IN ITS LANDSCAPE



Frontispiece; Cults Loch 3 crannog viewed from the NW. The reconstruction shows the crannog encircled by a light wickerwork fence, with an oak plank facade on either side of the entrance onto the settlement. A post-built causeway connects the crannog to the shore, sediments and vegetation gradually building up on either side of it. Within the crannog Structure 2 is occupied, reconstructed as an archetypal Iron Age roundhouse with conical thatched roof and wickerwork walls. A post-and-plank wall divides the interior, while an entirely speculative smaller roundhouse is being constructed in the S half of the settlement. Evidence for many of the structures in the reconstruction is presented in this monograph but much is of course, speculative. Nonetheless, the reconstruction evokes the size and spaciousness of the crannog as well as its proximity, and consequent vulnerability, to the shore (created by Marcus Abbott, York Archaeological Trust).

A Lake Dwelling in its Landscape

Iron Age Settlement at Cults Loch, Castle Kennedy, Dumfries & Galloway

Graeme Cavers & Anne Crone



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Front cover: Reconstruction of Cults Loch 3 crannog viewed from the NE (created by Marcus Abbott, York Archaeological Trust) *Back cover* (top): Cults Loch, showing the excavation of the crannog (Site 3) underway, with Cults Loch crannog Site 1 in the background; (bottom left): excavation of the Cults Loch crannog (Site 3) in progress in 2010; (bottom right): souterrain, post-excavation

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2007 Danielle Gorke, Gemma Hudson, Heather James

2008 Vivian Delf, Maria Grabowska, Hana Kdolska, Sarah Lynchehaun, and Diana

- 2009 crannog** Vivien Delf, Robert Lenfert, Pat Martin, Katie McFarlane, Pauline Megson, Stacey Turnbull, Fiona Watson
- 2009 terrestrial** Vicky Clements, Vivien Delf, Rob Engl, Pat Martin
- 2010 crannog** John Barber, Vivien Delf, Anne Dunford, Thierry Fonville, Heather James, Robert Lenfert, Pat Martin, Katie McFarlane, Ann Sackree, Glenis Vowles
- 2010 terrestrial** Vicky Clements, Alan Dalton, Thomas Legendre
- 2011 terrestrial** Rob Engl, Thierry Fonville, Kevin Paton, Stephen Potten

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providing practical guidance on issues of identification and interpretation, and editing the final report.

1 Introduction

The research framework

In 2005, the members of the Scottish Wetland Archaeology Programme (SWAP) hosted the Wetland Archaeological Research Programme (WARP) conference in Edinburgh, bringing together practitioners of wetland archaeological research from all over world (SWAP 2007). In European terms, the timing of the conference was ideal; the major development of infrastructure in Ireland in the early 21st century had meant that some of the most important wetland discoveries had recently been made, while developments in continental Europe were continuing to push the boundaries of a long tradition of prehistoric settlement archaeology. Archaeologists specialising in wetland archaeology were developing new ways of integrating ‘wet’ and ‘dry’ sources of evidence to find alternative ways of thinking about wetlands (eg Van der Noort & O’Sullivan 2006), and both practical and theoretical aspects of the study of waterlogged archaeology were healthy and fertile grounds. As the home of Robert Munro, one of European wetland archaeology’s pioneers (Munro 1882; 1890) Edinburgh seemed an apt venue for an international gathering of wetland archaeologists, and the conference took the opportunity to celebrate Scotland’s rich wetland archaeological resource.

However, many of the papers presented at the conference (as well as others published subsequently) took the opportunity to highlight how little is in fact known about the extent and nature of wetland archaeology in Scotland (cf Crone and Clarke 2005; Henderson 2004). The theme of taphonomy explored in the session on lake dwellings served to highlight how our understanding of the mechanics of Scottish crannogs as archaeological sites was still at a very early stage, and as such that few reliable generalisations could be made (Cavers 2007; Henderson 2007a; Crone 2007). Several discursive syntheses had highlighted that meaningful interpretations of the role of wetland settlement in prehistory could only be made if these sites were

considered an integral part of, not separate from the wider settled landscape (eg Henderson 1998; Harding 2000a), but by the early 21st century few inroads had been made and Scottish wetland archaeology seemed confined to the specialist periphery from which European practitioners had worked to break free (Coles & Coles 1996; O'Sullivan 1998; Fredengren 2002; Menotti 2012).

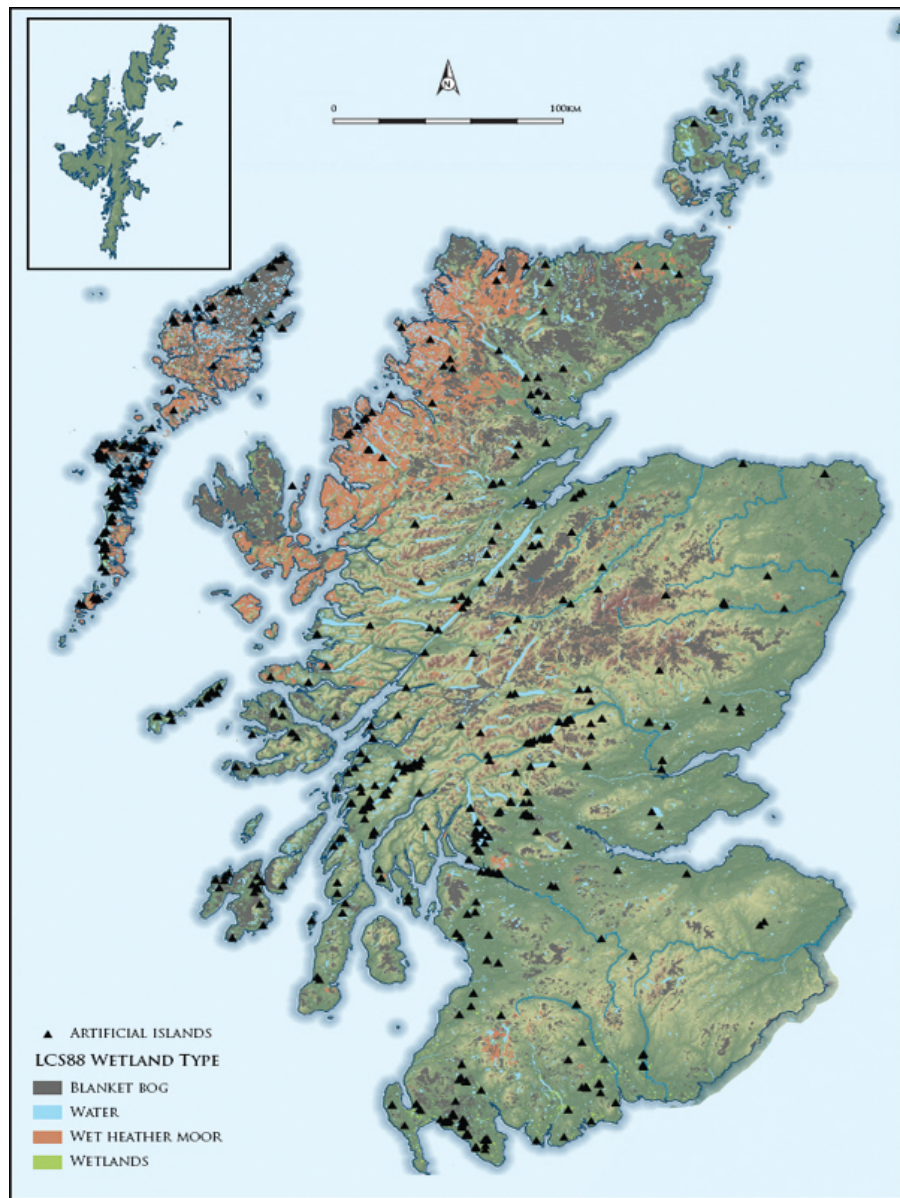
Acknowledging the dichotomy between the wealth of Scotland's wetland resource and the lack of study of wetland sites, the then MSP for Culture, Tourism and Sport Patricia Ferguson tasked Historic Scotland with initiating a programme of research into wetland archaeology in Scotland, with the aim of redressing the peripheral role of waterlogged sites and artefacts in the study of Scotland's past (SWAP 2007, ix). The first stage in this process was the compilation of a research agenda for wetlands (Cavers 2006a), which assessed the extent of our knowledge of the resource, and identified a series of primary research questions and themes designed to build on current understanding of activity in and around Scotland's wetlands through history.

Previous studies have shown that, although peatlands comprise a major component of Scotland's wetland environment, their archaeological potential is low, mainly because much of it is blanket bog and this was not intensively exploited in the past (Crone & Clarke 2005, 7). Occasional artefacts are found, buried in pockets of deeper peat but structures and trackways are very rare. The small areas of raised bog that survive do have more potential, as reflected in the discovery of the Neolithic platform on the edge of Flanders Moss (Ellis 2002), but assessments of other potentially significant bogs, Ballachulish (Clarke & Stoneman 2001), Moine Mhor (Housley *et al* 2007) and Achnacree (Clarke forthcoming), the latter two carried out as part of the SWAP programme, have yielded very little evidence of human activity.

What Scotland does possess in abundance is evidence for the extensive use of open water, and particularly for the settlement of water bodies and their margins ([Illus 1](#)). Crannogs, or perhaps more generically loch settlements of all forms seem to have been a significant component of the settled landscape of Scotland from at least the middle of the 1st millennium BC through to the modern period, and there is evidence, from sites like Eilean Domhnuill in North Uist (Armit 1996) that the tradition of living on open water has much earlier origins. There are references to just under 400 'crannogs' or related archaeological sites on islands in Scottish lochs, though, as is often acknowledged, the true number is very likely to be far higher

than this, and where systematic surveys have been carried out (as in Lochs Tay and Awe; Morrison 1985; Dixon 1982), the number of known sites has been greatly increased. The impact of this element of historic settlement in Scotland has not been in proportion to the potential offered by the known levels of preservation typically encountered on these sites (Barber & Crone 1993), and 100 years after the publication of Munro's *Ancient Scottish Lake Dwellings* only a handful of significant investigations had been carried out. The contribution of wetland settlement to wider archaeological understanding of prehistory and history remained obscure, limited to afterthoughts in the discussion of more significant settlement types.

The 2006 SWAP Research Agenda, then, placed the investigation of crannogs high in the list of priority areas for future research, with particular emphasis placed on understanding how the lake dwelling tradition had developed in Scotland, the role of crannogs in relation to the wider settlement system of prehistoric Scotland and how that role changed through time. The SWAP agenda undertook a geographical as well as thematic assessment of research potential, and identified the concentrations of loch settlements in Argyll and Dumfries and Galloway as key areas for further research. Among the key research themes was exploration of the relationship between wetland settlements and their contemporary 'terrestrial' counterparts during the later prehistoric centuries, the period when crannogs appear in large numbers in the archaeological record (Henderson 1998; Cavers 2006b; Crone 2012).



Illus 1. Distribution of artificial islands in Scotland

Three of the keynote projects undertaken during the first phase of fieldwork worked towards the investigation of this theme. The later Iron Age was approached through further fieldwork at Ederline crannog in Loch Awe, where previous excavations had demonstrated that the site, radiocarbon-dated by Morrison to the earlier Iron Age, was subsequently reoccupied in the mid-late 1st millennium AD, and may have been involved in redistributive trade with Dunadd

(Morrison 1985; Cavers & Henderson 2005; Henderson forthcoming). Though the areas of the site investigated through excavation appear to relate exclusively to the late Iron Age/Early Historic phase of use, the earlier Iron Age dates obtained for timbers protruding from the top of the site provide an instructive taphonomic lesson, and the model developed as an explanation for this is an essential consideration in the interpretation of radiocarbon samples from submerged crannogs (see discussion by Cavers 2007; Crone 2007).

The later 1st millennium BC was explored through excavations at Dorman's Island crannog in Whitefield Loch (Cavers *et al* 2011). This site, recorded during the SW Crannog Survey in 2002 and 2003 was known to be actively eroding, with rich organic deposits exposed on the eroding side of the site (Henderson *et al* 2003; Henderson *et al* 2006). Excavation was carried out on the above-water portion of the site, encountering substantial split oak logs and a prepared clay surface, probably representing the interior of a building. Fragments of a bracelet made from recycled Roman glass, as well as shards from a Roman glass vessel indicated activity at the site in the 1st or 2nd centuries AD, but the most significant result of the Dorman's Island excavation was the determination of a dendrochronological date from the oak timbers. This date, giving a felling range of 153–121 BC, was the first prehistoric dendrochronological date obtained in Scotland, achieved through matches with master sequences from Northern Ireland and Carlisle, and immediately opened the doors for a new era of lake settlement research in Scotland (Cavers *et al* 2011). For the first time, there was a realistic prospect of disentangling the superimposition of occupation phases on prehistoric crannogs, and improving on the ill-defined dating of activity on Scottish crannogs through the 1st millennium BC.

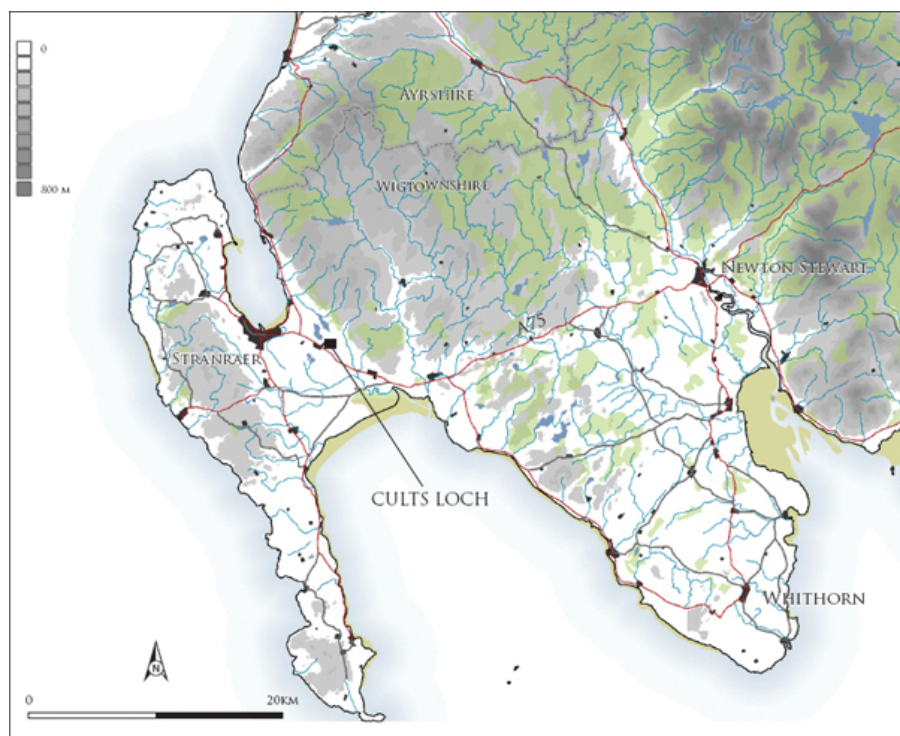
The promontory in Cults Loch (Cults Loch 3 – see note on site labels below) had attracted attention during construction of the SWAP research agenda for two reasons. Firstly, the radiocarbon date obtained from an oak stake sampled in 2004 was relatively early in the Scottish lake settlement chronology, calibrating in the period 550–200 cal BC (GU-12138), and secondly, the form of the site was unusual. The oak stakes encircling what appeared to be a stony natural promontory in the loch was an arrangement unlike any other crannog known in Scotland, and had raised the possibility that the site represented the remains of a loch-side dwelling of the type apparently widespread in Ireland (eg O'Sullivan 1998) but hitherto unknown in Scotland. Coring carried out during the first phase of the SW Crannog Survey in the late 1980s (Barber & Crone 1993) had recovered

charcoal and burnt bone from deposits on the promontory, raising the prospect that occupation deposits were preserved that could be related to the perimeter stakes, so that the site was shortlisted as a candidate for the investigation of the origins of the lake settlement tradition in Scotland.

Cults Loch is located on the Luce isthmus of Galloway, a narrow stretch of low-lying land separating the Rhinns from the Machars (Illus 2). The area constitutes some of the best-quality agricultural land in Wigtownshire, and has apparently always been a focal point for settlement. The rich cropmark record of the surrounding fields (Illus 3), one of the RCAHMS's key 'honeypots' in SW Scotland (Cowley 2002), demonstrated that Cults Loch, with the adjacent Black and White Lochs to the west and Souleseat Loch to the south had been at the centre of a densely settled landscape throughout the later prehistoric period, and was surrounded by evidence for multiple ditched and palisaded enclosures at Sheucan and Chlenry (Cults Loch 5) and a fort on the opposing side of the loch (Cults Loch 4), as well as probable barrows of unknown date at Balnab. In addition to these 'terrestrial' settlements, radiocarbon dating of the crannog surviving as an island in the centre of Cults Loch (Cults Loch 1) had demonstrated activity there in the Roman centuries (cal AD 120–390; GU-10919), while antiquarian investigations at the artificial islet in Black Loch (Loch Inch-Grindl) had produced artefacts suggesting a late Iron Age or early historic occupation of that site (Dalrymple 1873). The opportunity, therefore, was presented for the investigation of settlement evolution and development through the Iron Age, with the investigation of the role of the Cults Loch promontory central to the exploration of the development of lake settlement and its relationship with contemporary and successive terrestrial sites. The presence, furthermore, of an area of deep peat to the NW of Cults Loch offered the prospect of an associated multi-proxy environmental investigation, correlating peatcore evidence with the nearby archaeological record.

The Cults Loch area, therefore, appeared to offer the opportunity to explore what circumstances had resulted in the choice of settlement in water, within a landscape that was otherwise populated by typical later prehistoric settlements. Could the construction of crannogs be tied to discrete chronological horizons, which might draw the conclusion that their presence was related to certain socio-political conditions, were there functionally-specific reasons for building on or near water, or were less practical factors in play? During the course of the Cults Loch programme, further reasons for requiring a 'landscape' approach to these questions emerged, when the dendrochronological

dates from work on south-western material began to suggest that crannog construction activity might fall into episodic horizons noted in Irish material (Crone 2012), so that the apparent ubiquity of crannog occupation throughout Scottish prehistory might be misleading. Only contextualised, multi-site investigation could test hypotheses like these, and it is certain that further work will be required to explore these possibilities.



Illus 2. Location of Cults Loch

The landscape setting; geology and hydrology

Cults Loch lies on the eastern edge of the Stranraer Lowlands. The underlying geology is mostly Ordovician and Silurian greywackes and shales on the uplands to the north and new red sandstones under the Stranraer Lowlands which are deeply covered with fluvioglacial deposits. The area has been extensively modified by glacial deposition and erosion, producing an undulating landscape of relatively low altitude. This is a predominantly pastoral landscape of herb-rich pastures, bordered by the till- and peat-covered Cree-Luce moors. Cults Loch itself is surrounded by very flat land (Illus 4); to the south

is an old airfield which was used as an air gunnery school during the WW2.

Cults Loch is the smallest of a series of lochs which are strung out along the edge of the Stranraer Lowlands ([Illus 5](#)). To the NW lies the Black Loch, or Loch Inch-Cryndil, and the White Loch; although originally separated by a narrow strip of land these are now joined by a man-made channel at their southern ends. The Black Loch is fed by the Messan Burn which drains into Loch Ryan, and the Sheuchan Burn which flows into it from the Cree-Luce moors. Cults Loch itself is predominantly groundwater fed and has no natural outlets, although the loch is now connected to a modern drainage channel in its SE corner which drains into the Chlenry Burn and south into Luce Bay. There was a flour mill at this end of the loch in the mid-19th century and what looks like a lade draining into the Chlenry Burn ([Illus 6](#)); the modern drainage channel may follow the old course of this lade.



Illus 3. Archaeological sites around Cults Loch



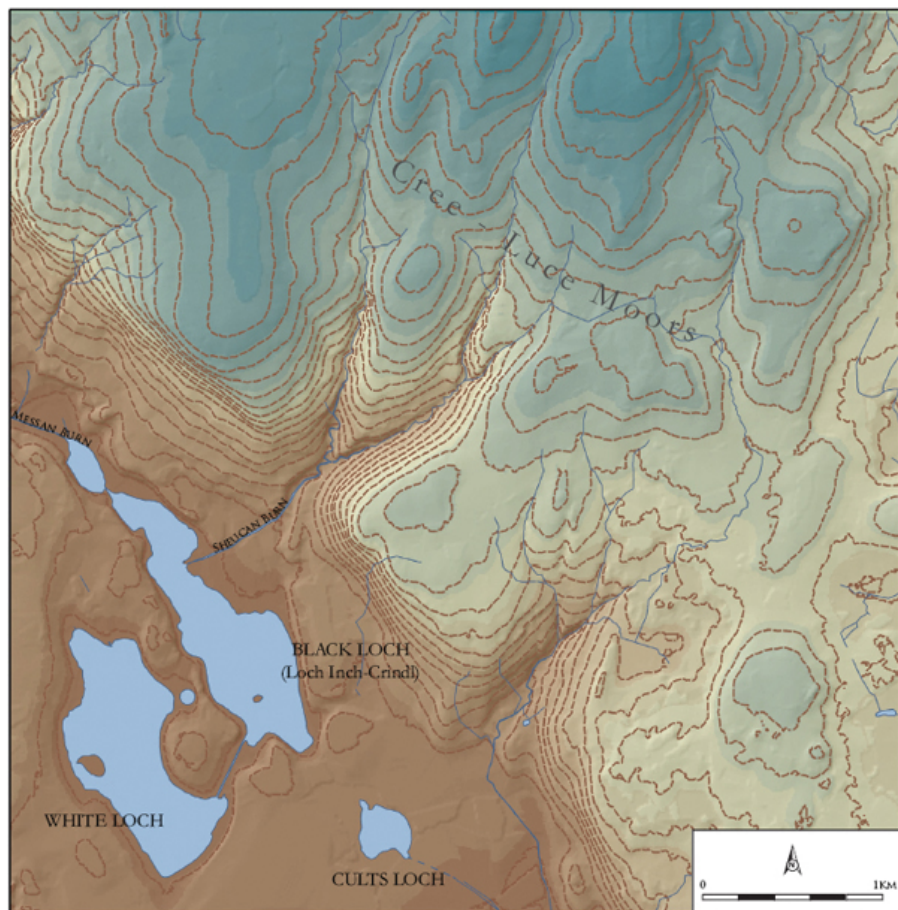
Illus 4. The landscape around Cults Loch

According to the bathymetric survey of Cults Loch undertaken by Murray & Pullar in 1903 ([Illus 7](#)), the western half of the loch is

relatively shallow, shelving gently from 1.5 m to 2.5 m across half its width. Cults Loch 1 is situated on the edge of this shelf. The loch then plunges steeply to the east, to a maximum depth of 8.6 m not far from its eastern shore.

The loch is now small, only 0.6 km² but it was probably more extensive in the past because the northwestern section of the loch is now terrestrialised. This section is separated from the main body of the loch by the natural promontory on which Cults Loch 5 sits, and by the development of a promontory behind Cults Loch 3 which was positioned on the opposite shore at the narrowest point of the loch. Peat began to develop in this area at about 7500 cal BC ([Chapter 8](#)). Marshland is depicted on the OS 1849 map ([Illus 6](#)) but this had expanded by the late 20th century, constricting the body of standing water in this area even further ([Illus 8a](#)).

As it is dependent on precipitation water levels in the loch will always have fluctuated. Water levels must have been low enough in the past for the peat deposits under the crannog to develop and for the crannog builders to identify the raised dome of the loch bed as an ideal location for construction ([Chapter 2](#)). The earliest depiction of the loch, on Roy's mid-18th century military map ([Illus 8b](#)) shows a body of water which appears to extend much further north and differs in outline from that of today's loch, suggesting that it was much expanded at this time. In the 20th century there is anecdotal evidence for extreme fluctuations caused by drainage; some time in the 1960s employees of Stair Estates were reportedly able to walk out to Cults Loch 1 after the loch was temporarily drained (Henderson *et al* 2003, 97). Some hyperbole might be involved as this would imply a drop in water levels of c 2 m (see [Illus 7](#)). Nonetheless, water levels have fluctuated in recent times, as witnessed by the observation of stakes around the crannog by visitors, seen in 1872 and 1986 but not in 1987 (RCAHMS 1987, 56) or 1989, for example (see below). In 2002 the landowner cleared the drainage channel in the SE corner of the loch and for a while water levels were some 0.3 m below previous levels (Henderson *et al* 2003, 98) but it is now blocked and water levels are higher than before.



Illus 5. The hydrology around Cults Loch

A history of previous archaeological investigations at Cults Loch

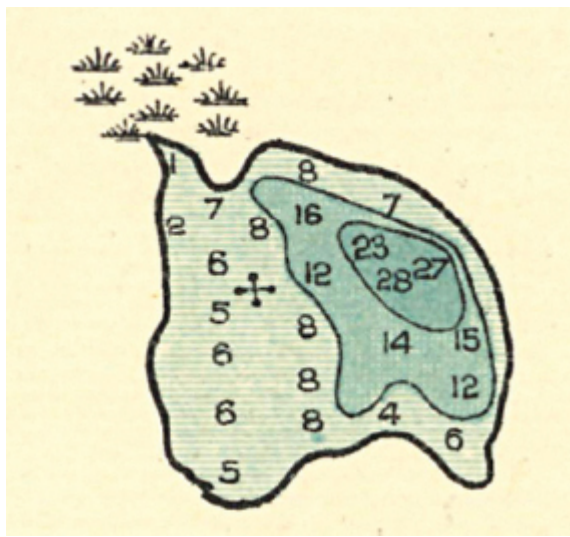
In 1872 the Rev George Wilson walked around the shores of Cults Loch, recording anything of archaeological interest in his notebook (Wilson 1874, 294–5). It was presumably at a time of low water levels, because he recorded and roughly planned oak stakes around the promontory ([Illus 9](#)). It had long been assumed that the ‘numerous beams and stakes’ he had observed along the shore of the loch were those around the promontory (RCAHMS 1912, 23–4; RCAHMS 1987, 56). However, he was actually referring to a scatter of timbers which stretched for more than 200 m along the southern shore of the loch and which he meticulously planned on loose sheets of blue paper ([Illus 10](#)). They lay in a soft peat or clay which quaked when walked upon. He noted that the timbers were mostly oak, but with small

timbers of birch and possibly willow, and that there was no evidence of carpentry in the form of side notches or mortise holes. These timbers were not observed by any subsequent visitors to the loch and the authors were unable to locate them, although this may be because of high water levels. These timbers are unlikely to be naturally deposited and must therefore represent some sort of artificial construction along the shore, the nature and date of which must remain unknown. He also measured and recorded a crescentic shaped knoll in the northwestern section of the loch, Cults Loch 2, which he thought might be artificial.



Illus 6. Cults Loch in the mid-19th century; the OS 1st edition map 1849

While checking Wilson's observations in 1986 Jane Murray (pers comm) also noted stakes around the promontory and found the rubbing stone SF 08/14 (McLaren *infra*) at its southern end. The promontory was initially listed as a 'possible crannog site' during the SW Crannog Survey (Barber & Crone 1993), and subsequently described as a dryland crannog because coring indicated that the site was '... completely dessicated, revealing only charcoal and some burnt bone ...' (*ibid* 526). The stakes around the promontory were not observed during this survey, suggesting that water levels were high.



Illus 7. Bathymetric survey of Cults Loch; Murray & Pullar 1903

The deteriorating condition of crannogs in SW Scotland remained a concern and in 2002, as a result of the SWAP initiative (see above) a condition survey of 22 sites was undertaken (Henderson *et al* 2003). Cults Loch was one of six lochs recommended for monitoring following evidence for fluctuating water levels within the loch (ibid 98 and see above). Cults Loch 3 was surveyed in 2003 and a detailed digital elevation model was created (Henderson *et al* 2006, 38-40). Lowered water levels had again exposed oak stakes in the shallows around the promontory and these were also surveyed in (ibid fig 8) and sampled for radiocarbon-dating (GU-12138; [Table 1](#), see [Chap 2b](#)). The possibility that the promontory represented a lochside settlement was raised for the first time (ibid 40).



Illus 8. a. Google Earth view of Cults Loch; b. Cults Loch on Roy's Military Survey of Scotland, 1747–1755

Cults Loch 1 is indisputably a crannog and was scheduled as such in 1998. Its position is indicated by a reed bed which grows over the crannog but the crannog itself is usually fully submerged. It was examined underwater as part of the 2002 condition survey when timbers were sampled for radiocarbon-dating, and a contour survey was undertaken in 2003 (Henderson *et al* 2006, 36–37). It consisted of a circular mound, 24 m in diameter and rising 3.5 m off the loch bed, remarkably regular in both plan and profile. It was protected by a c 1 m thick layer of silt below which structural timbers could be felt rather than seen. Many were horizontal while others lay at angles of 45°, suggesting that they may be stakes which had collapsed outwards. Oak and alder timbers were present. Vertical oak stakes were noted



Illus 11. Trench plans for the 2007–2010 excavations

Cults Loch was one of five lochs chosen for a pilot monitoring programme which ran from July 2004 to November 2005 and a cluster of piezometers was installed on Cults Loch 1 (Lillie *et al* 2008). The aim of the monitoring ‘... was to investigate and identify any seasonal change on and around the crannogs, determine whether the sites are stable or decaying; and if the sites are shown to be decaying, to determine the causes of the decay as identified.’(ibid 1887). High levels of saturation were observed at Cults Loch 1 with little seasonal fluctuation (although note the historic record of major fluctuations in the water level – see above) over the monitoring period but despite this Lillie considered the crannog to be unsustainable in the long term because of the sandy substrate on which the crannog is built, combined with its use as a nesting site by swans (ibid 1896). Furthermore, monitoring at nearby Barlockhart crannog had showed that despite high saturation levels, the chemical status of the burial environment can be affected by high rainfall levels, probably by introducing oxygenated water into the loch catchments and increasing *in situ* redox levels.

Methodology

A fieldwork strategy was designed to address the research questions outlined above, with a multi-season excavation of the promontory crannog, Cults Loch 3 forming the centrepiece of the project. Three seasons of investigation were carried out on the cropmark sites surrounding the loch, comprising an evaluatory exploration of the promontory fort, Cults Loch 4, the palisaded enclosure at Chlenry cottages, Cults Loch 5, as well as some of the minor features visible in aerial photographs. During this phase, a series of pits were found in a randomly-placed 'control' trench located to the north of Cults Loch 3, clearly representing the presence of an archaeological site that was not present in the aerial photographs (see Cults Loch 6, below), and serving as a reminder that the sites visible from the air are of course unlikely to represent the full range of sites present. This evaluation phase was followed by excavations at Cults Loch 4 and at Cults Loch 5. A small exploratory trench was also excavated on the top of the knoll, Cults Loch 2. A programme of geophysical survey ran alongside the excavations, though the results were variable in their success. Cults Loch 1 was not investigated as part of this project, mainly because of the expensive logistics involved in mounting an underwater excavation, which would have detracted from the main focus of project. All that is currently known about the Cults Loch 1 is summarised above.

Excavations at Cults Loch 3 have revealed that the site had initially been built as a free-standing crannog but later in its occupation sediments were deliberately laid down to create a substantial causeway, thus forming the promontory that exists today. Consequently, the term 'promontory crannog' has been applied to Cults Loch 3 to distinguish it from those crannogs which remained free-standing throughout their occupation. Excavations there began in 2007 with a small evaluation trench and were followed by open-area excavations of portions of the site in 2008, 2009 and 2010 ([Illus 11](#)). In all, just over 35% of the crannog has been investigated. Wetland excavations are generally logistically challenging, and this was particularly the case when Cults Loch 3 proved to be entirely artificial in character and so effectively still partially submerged in the loch. Unfortunately, fieldwork in 2008 and 2009 was accompanied by some of the wettest weather for the time of year on record in SW Scotland, and water coming from both below and above made conditions very difficult. The SW half of the site could not be investigated at all because of the increased loch levels, while flooding prevented full exploration of the causeway deposits at the neck of the promontory. Indeed, the position of the excavation trenches each year was

eventually predicated more by the areas of drier land available than by archaeological demands. Drainage within the excavation trenches was a constant problem and was dealt with by digging deeper channels in front of baulks and sinking deeper sumps to accommodate the pump hose.

The fortunes of the project turned in 2010, however, when a good spell of weather accompanied the investigation of some of the most critical relationships and structures on the site, and while, as on all archaeological excavations, lessons were learned with the benefit of hindsight, the results presented here can be considered a good characterisation of the remains encountered on the site.

The community initiative

The project at Cults Loch has also been used to foster an interest in the cultural heritage of the area through a programme of community participation and outreach. Local volunteers were encouraged to participate in the excavation, an open day was held each year and progress was reported in a daily web-diary. Funding from LEADER II in 2009 enabled us to develop an extensive schools programme and an exhibition at Stranraer Museum, both focused on Cults Loch and its crannogs. During the 2009 season the excavation was visited by c 250 children from six local primary schools, and this was followed up in March 2010 by a week-long touring school's programme, the format designed in discussion with local head-teachers. The children were encouraged to learn about their past through a series of activities: powerpoint presentation on the archaeology of Cult Loch and crannogs; a time-line game; mock-up excavations; object handling sessions; and a 'what objects tell us' teaching session. Sessions were held at the primary schools of Drochdruil, Castle Kennedy, Park Primary, Belmont, Rephad, Portpatrick and Sandhead, and over the course of the week c 350 children took part in the activities.

A month-long exhibition was hosted in Stranraer Museum in January 2010 in partnership with the hosts. The exhibition displayed some of the finds recovered during the Cults Loch excavations and display boards were prepared for the exhibition which outlined some of the key findings. The display was well-received with 427 people visiting the Museum in January. An object handling session was also organised in April 2010 to compliment the school's touring programme. This was again undertaken in partnership with Stranraer Museum and involved object handling, object recognition and worksheets. During the week 165 children took part in the activity.

One of the aims of the initiative was to empower local communities to discover their own heritage and this has been seen in the additional work undertaken by the local schools. Stimulated by their visit to Cults Loch Belmont Primary School undertook a major display in their school foyer which documented their visit to the excavations and their attitudes to archaeology. Numerous schools have also undertaken illustrations and the writing of poetry and/or short stories relating to their experience of the crannog. Spurred on by their object handling class Park Primary visited Whithorn to find out more about their archaeology and subsequently undertook a project on the Vikings.

Note on site labels

Some of the sites in and around Cults Loch had already been given numeric identifiers as part of their site name by the Royal Commission and, as these have been used in previous reports on the work at Cults Loch this system will be applied in this volume, and extended to the other sites under discussion here. The existing and new numbers are listed below together with their Canmore site number and appellation;

Cults Loch 1 (NX16SW 14)	island crannog
Cults Loch 2 (NX16SW 109)	knoll
Cults Loch 3 (NX16SW 110)	promontory crannog
Cults Loch 4 (NX16SW 18)	promontory fort
Cults Loch 5 (NX16SW 24)	palisaded enclosure at Chlenry Cottages
Cults Loch 6	pits

2 Cults Loch 3; the promontory crannog

2A THE STRUCTURAL SEQUENCE

As described in [Chapter 1](#) conditions for excavation on the crannog were challenging, with wet weather and rising loch levels frequently hampering progress. These difficulties were compounded by the condition of the archaeological deposits themselves. It is clear from what we know of the fluctuations in water levels in the loch ([Chapter 1](#)) that the uppermost levels of the crannog must have been subjected to frequent episodes of drying-out, with the consequent aerobic decay and mechanical compression of the organic components. In the proposed decay trajectory which has been modelled for crannogs (Crone 1988, 47, fig 10; Cavers 2007) the organic deposits would conflate over time, only the inorganic components and more robust organics surviving as recognisable entities, leading to the development of non-conformities in deposits across the site. Cults Loch 3 was covered by such a conflation horizon, referred to below as the Phase 5 decay horizon, in which the boundaries between organic deposits have been hard to identify both in section and in plan, and in which much of the wood was so degraded as to have lost its original form and structure. This was particularly the case with horizontal timbers, and although the tips of stakes survived well if they were below the water table, their upper sections were often so degraded that it was difficult to determine initially whether they were a vertical timber ([Illus 12](#)). Consequently, it has been frequently impossible to assign stakes to structures or levels, other than on the basis that they fell within the projected footprint of that structure.

A suite of analyses have been employed to test the on-site interpretations of the various deposits. These include analyses of their ecofactual content, the charcoal, macroplant, insect remains and burnt bone, as well as targeted micromorphological and palynological analysis of sequences of deposits from kubiena and monolith samples.

This evidence is presented fully in [Chapter 2c](#) but the results are also referred to in this chapter in those instances where they are able to confirm, change or enhance the on-site interpretations.



Illus 12. The upper end of this alder post has decayed and bent over so that, on exposure it was initially thought to be a horizontal

[Illus 13](#) is a summary plan of the excavated features on the promontory while [Illus 14](#) zooms in on the excavation trenches. Six phases of construction and/or occupation have been identified;

Phase 1; construction of the crannog mound. The causeway may have been built at the same time but there is no evidence to demonstrate this.

Phase 2; construction and occupation of Structure 1 (ST1)

Phase 3; construction and occupation of Structure 2 (ST2)/deposits and structures in the N quadrant

Phase 4; construction and occupation of Structure 3 (ST3)

Phase 5; the decay horizon. This may contain a number of unidentifiable phases of activity.

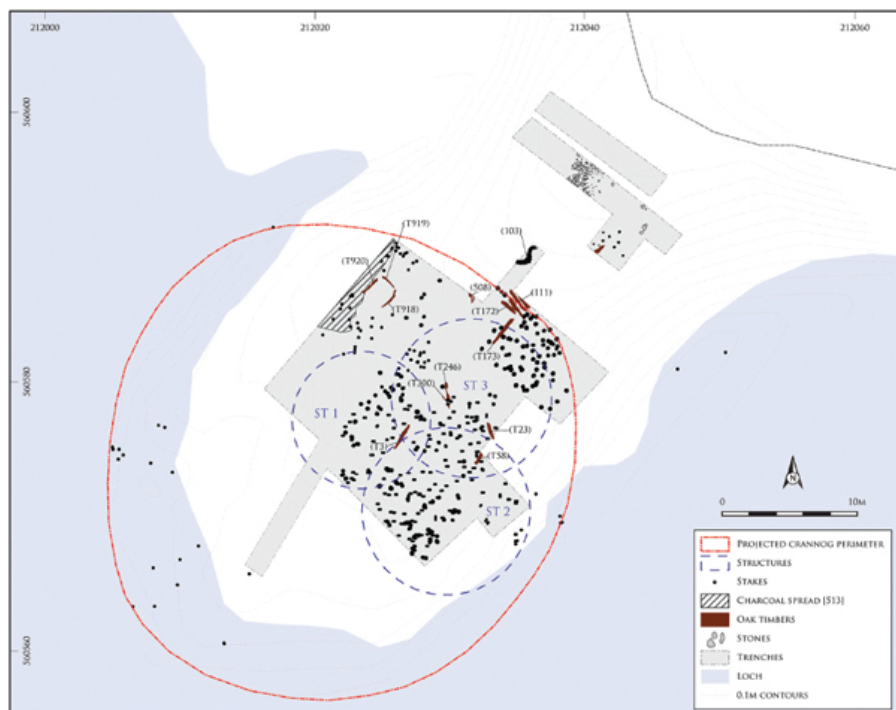
Phase 6; renovation of the causeway. This phase was only identified by a single dendrochronological date

Phase 1; construction of the crannog mound

Coring with a Dutch gouge in transects across the site ([Illus 15](#)) revealed the make-up and depth of the crannog mound and the nature of the loch bed below it. The loch bed appears to form a raised dome under the centre of the crannog, over which peat deposits (112 = 632) were able to develop. This must mean that water levels were low enough at times in the loch for the peat to have developed, while the

raised surface of the loch bed in this area made it an obvious choice for the location of the crannog.

The crannog mound was created by dumping large logs, brushwood and other organic materials on top of the dome and pinning it down with stakes. These deposits had survived to a maximum height of 1.1 m above the loch bed as timbers in a matrix of amorphous organic material rich in woodchips (109 = 524 = 631). A charcoal-rich lens which contained fuel and food debris was observed in some of the cores, just above the natural peat surface (see [Illus 35.2](#)). The structure of this foundation deposit was only glimpsed in some of the deeper trenches. Under ST3 large alder timbers (223) had been laid down at right angles to each other, and above these were a layer of smaller logs (220), also of alder. These foundation deposits were more fully exposed in the N quadrant where large alder and oak logs (526), up to 0.26 m in diameter and up to 2 m long had been laid down in no particular pattern ([Illus 16a](#)), with bundles of small alder branchwood in between ([Illus 16b](#)). Amongst these were two forked stakes, T916 and T956, which appear to have been inserted upright and then broken off at ground level ([Illus 16a & 94](#)).



Illus 13. Plan of the promontory showing the overall size of the crannog, the position of the structures and other main features including the relationship of the causeway to the crannog. Oak timbers in the decay horizon are recorded on this plan

Scattered across the crannog were stakes (509, 217, 105) which were invariably either alder or oak. Those that were visible upon removal of the topsoil were inevitably oak, the decayed tufts of heartwood projecting above the surface of the crannog ([Illus 17 & 36](#)). The aerobic conditions in the upper levels of the site had resulted in the top sections of many non-oak stakes bending with decay until they lay almost horizontal on the surface ([Illus 12](#)). Thus, the alder stakes rarely survived above the surface and were often initially identified on the excavated surface only as reddish-brown smears.

The stakes varied considerably in both diameter and the depth to which they had been driven into the crannog mound. The majority of stakes were between 0.14–0.20 m in diameter but they ranged from 0.08 m to 0.28 m. Some stakes had been driven up to 1.4 m into the crannog mound while others had been inserted only 0.3 m below the surface ([Illus 18](#)). In some areas, such as on the NE and SE peripheries of the crannog, the stakes were quite densely spaced, between 0.3–0.5 m apart. In some of the deeper trenches small stakes were exposed, the upper parts of which had not survived in the upper levels, so the density was probably even greater. For instance, clusters of small hazel stakes (221 & 222) were exposed around T207 some 0.5 m below the crannog surface ([Illus 19](#)).

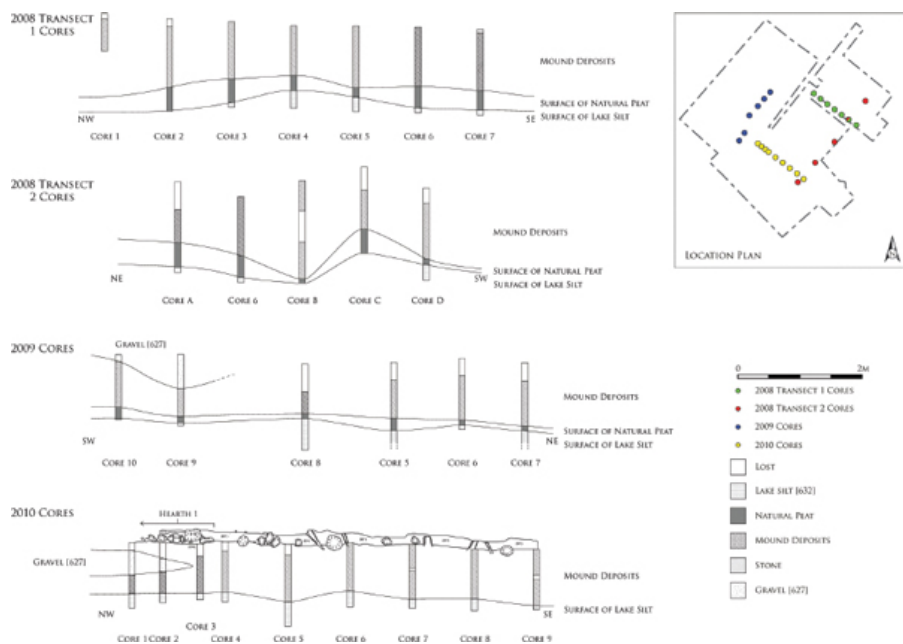
It was not possible to discern any patterning in the spread of stakes over the crannog ([Illus 13](#)). Some probably did form elements of the superstructure of the buildings (see below) but the bulk of them, especially around the periphery, were probably inserted during the construction of the crannog mound, to pin down and contain the building materials as they were dumped. This best explains the variety of depth to which the stakes were driven, and the density of stakes observed in some areas.



Illus 14. The main excavation trenches showing the timber components of each structure and the relationships between them

There was no unambiguous evidence for a defensive perimeter around the crannog. The boundary of the crannog was only ever encountered in the NE quadrant where stony, sterile mineral soils with no organic component (104, 216, 224) are interpreted as representing the natural infilling of the loch, interleaved with dark bands of hearth debris (225) which had been sorted by the waters lapping around the site (Illus 13, 40 & 41.1). A 'line' of three stakes (105) in the 2007 evaluation trench appeared to define the boundary of the crannog

mound at this point but the line could not be traced further to the east (Illus 13 & 47). Instead, a wide, dense band of stakes lay along the NE boundary of the crannog, with no clear alignment distinguished by size which might have formed a perimeter fence. A cluster of stakes in the NW corner of the site (509) probably represented a continuation of the band. A scatter of oak stakes was also observed around the promontory during the initial assessment in 2003 when the water levels were lower (Henderson & Cavers 2003) and it seems likely that these formed part of the same band, the non-oak stakes not having survived above the loch bed. A non-oak stake encountered during coring on the southern tip of the promontory supports this interpretation. The crannog mound, as defined by this band of stakes was thus roughly circular in plan, approximately 34 m in diameter and covering some 895 m².



Illus 15. The coring survey



Illus 16. a. bundles of branchwood and a forked timber, T916 in the upper layers of the crannog mound; b. Logs [526] and branchwood which form part of the crannog foundation in the N quadrant



It is possible that the perimeter of the crannog was defined by a hurdle fence. On the NW edge of the excavation there was a large spread of carbonised wood fragments (513), up to 0.17 m thick in places and extending some 17 m along the NW baulk and 5 m out into the trench (Illus 13 & 35.3). This deposit was composed almost entirely of hazel and willow roundwood, a small proportion of which was larger in diameter than the bulk of the assemblage. The most plausible interpretation of this deposit is that this was the remains of a hurdle fence, the larger diameter hazel and willow roundwood representing the stakes while the smaller hazel roundwood are the withies. Its location on the periphery of the crannog makes it a candidate for the perimeter boundary.



Illus 17. Stakes appearing across the 2008 trench. The stakes projecting above the surface are all oak but scattered amongst these were numerous alder stakes (see [Illus 12](#)) which only became visible as the decay horizon was removed. The stone spread [214] lies in the foreground



Illus 18. These stakes illustrate the difference in size and in the depth to which the stakes had been driven into the mound. The blackened, decayed upper ends are aligned at the same level at which they projected above the decay horizon

Phase 2; Structure 1

The foundation deposit for this structure was a mound of coarse grey gravel (627) which was up to 0.5 m thick. It was seen under the hearth foundation, H1, in Cores 2010/1 and 2, and in Cores 2009/9 and 10 ([Illus 15](#)) so it was at least 2.5 m across ([Illus 20](#)). Large alder

roundwood logs (525 = 638), up to 0.2 m in diameter and circa 1.5–2 m in length, had been laid over the gravel mound forming a rough corduroy surface. In amongst these logs was a homogeneous brown peat (634); discrete deposits of hazelnut shells were observed during excavation and post-excavation analyses have demonstrated that the deposit was also rich in other charred food residues, as well as the remains of plant litter flooring material. This deposit may thus represent the build up of occupation debris over the logs. The wooden box, SF38 was found within this deposit ([Illus 23](#)).



Illus 19. One of the small hazel stakes (221 & 222) exposed around T207

A sub-floor of small alder logs (619) had been laid over the corduroy surface, contained within a hexagonal framework of similar-sized logs (630) ([Illus 21.1](#) & [22a](#)); the latter had a diameter of *circa* 4.3 m and

may have encircled the gravel mound ([illus 20](#)).



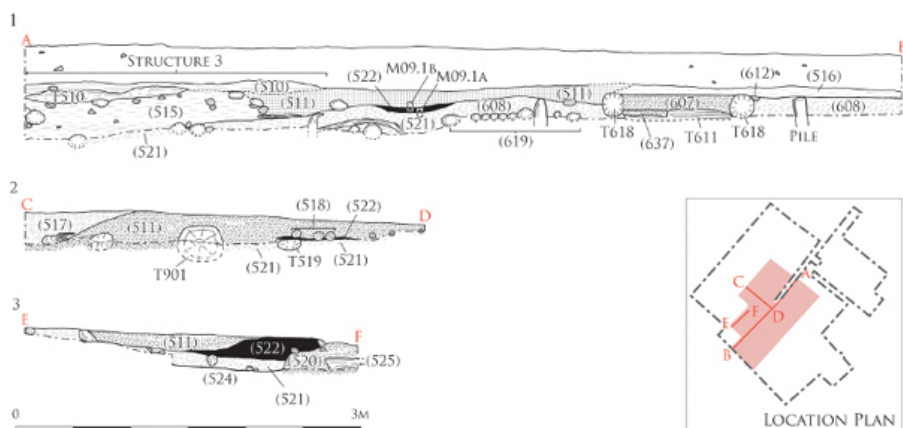
Illus 20. Structure 1; plan of the foundation structure and primary features

A hearth foundation, H1, had been constructed over the gravel mound on its eastern edge. It consisted of a rough framework, approximately 1.30 m square, formed by three logs (618) (the W side may not have been recognised as such during the 2009 season), the base of which was lined with parallel small logs (611), approximately 1 m in length, which had been laid down at right-angles to the logs of the sub-floor ([illus 21.1](#) & [22b](#)). The box contained two gravel fills, a lower grey gravel (637) and an upper orange-brown gravel (607), neither of which contained any hearth debris. However, a small patch of hearth debris (612) abutted the S side of H1 overlying the plant litter flooring (see below).

Abutting the N and S sides of H1 and overlying the subfloor (619) was (608 = 521 = 633), a discontinuous layer of laminated plant litter, up to 0.12 thick, interpreted as a primary floor surface ([illus 21.1](#), [22b](#) & [23](#)). It could not be traced to the E of H1 but it was identified in patches over a roughly oval area 7 m × 4.5 m to the N, S and W of H1. On its northeastern periphery the floor sealed the

ardshare, SF22, while on its eastern periphery, it lay directly over the massive carbonised oak timber, T157 (Illus 23, 81 & 82).

A sequence of deposits on the northern edge of the structure suggests that the floor of ST1 was regularly resurfaced. A mound of grey-yellow gravel (520) containing food waste and hearth debris and approximately 2.1 m in diameter was laid over the plant litter floor just in front of the large oak log, T901 which appears to define the northern edge of the hexagonal framework (630) (Illus 21.3, 23 & 24). A group of timbers (519) comprising alder and oak planks, some of which appear to have been re-used, were laid down in front of and at right angles to T901, to form a new floor surface. Several of these timbers displayed patches of burning on their upper surfaces and over them was a charcoal-rich deposit (522) which probably represents regular episodes of hearth rake-out (Illus 21.2). A thicker deposit of (522) lay over the southern edge of the gravel mound (Illus 21.3); there may have been a hearth on the dome of the gravel mound which has not survived. A surface of small alder and hazel logs (518), 0.08 m to 0.11 m in diameter was subsequently laid down over (522) in parallel with T901 (Illus 24). This sequence of refurbished floor surfaces was not extensive, covering an area of roughly 3 m × 3.7 m. It may have been more extensive and has only survived in this area because it has slumped down the side of the gravel mound. Alternatively, the floor in this area may have had to be frequently resurfaced because of slumping of the infrastructure during the occupation of the building. The plant litter floor appears to abut the gravel mound to the south (Illus 21.3) so there may have been smaller phases of refurbishment in this area which could not be detected.



Illus 21. Structure 1; sections 1–3



Illus 22. a. H1 with gravel fill [607] in situ. The hexagonal framework [630] is exposed, within which patches of the sub-floor of small alder logs [619] can be seen, overlying the larger alder foundation timbers [638]; b. H1 after the removal of its gravel fills. The basal logs [611] are exposed. A patch of the plant litter floor surface [608] lies to the right of the hearth

The final resurfacing episode in ST1 is represented by (511), a deposit of coarse sandy gravel up to 0.25 m thick in places and flecked with cooking and hearth debris ([Illus 21.1](#)).

Phase 3; Structure 2

There is no visible stratigraphic relationship between ST1 and ST2 but it is argued that ST2 is later than ST1 because the floor plan of the former appears to truncate the latter. There is no surviving evidence for floor deposits to the east of H1, suggesting that they might have been truncated/ removed by the construction of ST2.

As in ST1, the foundation deposit of ST2 was also a deposit of coarse gravel, (640) glimpsed only under the hearth foundation, H2 ([Illus 32](#)). The gravel probably did not extend much beyond the limits of H2, much like the gravel mound in ST1; it was not seen in any of the 2010 cores ([Illus 15](#)). A log sub-floor (624) was laid down around H2 ([Illus 25, 26 & 27.1](#)), which was probably the central focus of the structure and is described in detail below. (624) was best preserved to the W of H2. Here, large alder logs, up to 0.22 m in diameter and nearly 2 m long, were tightly aligned in parallel with the E edge of H2. To the N, S and W of H2 this regular surface was not observed. Instead, a surface comprised of tangentially aligned alder logs (642) encircled H2 ([Illus 25 & 28](#)). This surface lay directly over the foundation deposits of the crannog mound and directly under the amorphous organic material (210 = 601) which covered the S part of the promontory, and was distinguished by the absence of any mineral deposits, except for a small patch of orangebrown gravel (613) just in front of the S baulk.

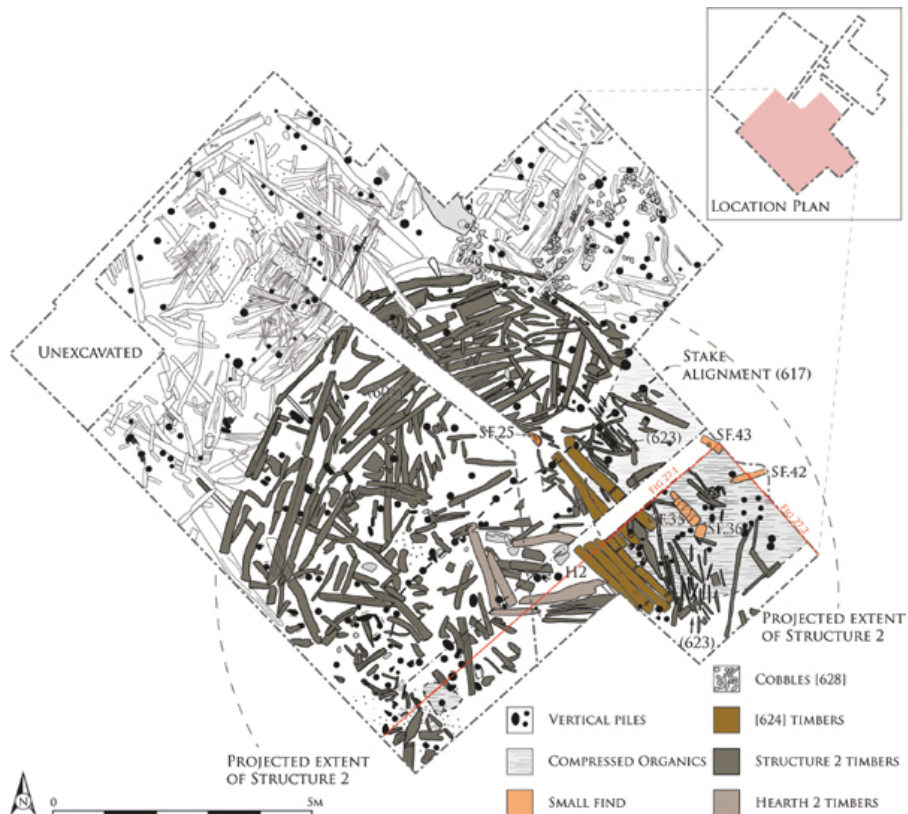


Illus 23. Structure 1; plan showing the gravel mound [520], the extent of the plant litter floors, the timber surfaces [518] and [519], and the artefacts below the floors



Illus 24. Structure 1; in the foreground is the oak log, T901, with the upper surface of small logs [518] in situ. Below these, some of the re-used planks of surface [519] are visible. The dome of the gravel mound [520] is just visible just below the upper ranging rod

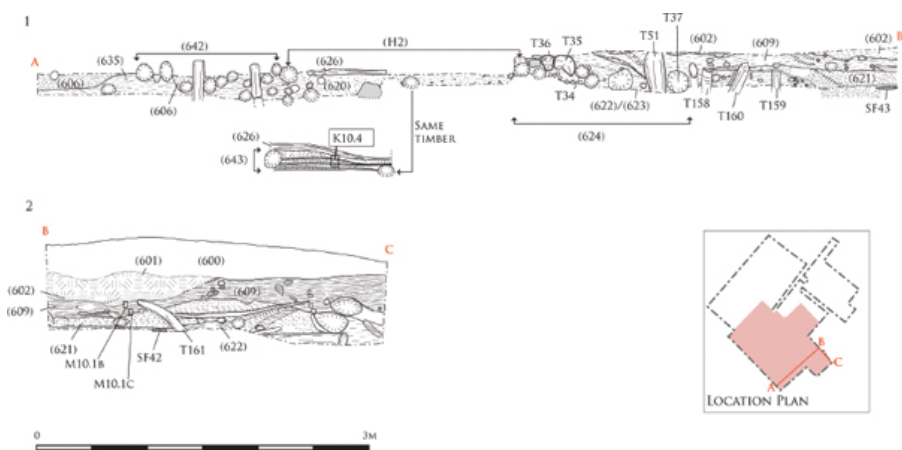
The sub-floor (624) was overlain by a deposit at least 0.15 m thick which consisted of brushwood as well as bracken and herbaceous stems (622), and contained within it small alder and hazel branches (623) (Illus 25 & 27.1). All the board-like objects, SF24, SF35, SF36 and SF43, and the bat-like object, SF42 were found within this layer (Illus 25 & 29). There may have been a hiatus in occupation caused by flooding of floor (622/623) during which weeds were able to colonise the floor surface. A thick deposit of gravel (621) up to 0.17 m thick in places and containing numerous organic lenses and ashy patches was subsequently deposited over (622/623) (Illus 27.2). A floor of plant litter (609) was subsequently laid over the gravel surface. This floor was frequently refurbished by the addition of fresh plant litter, producing a strongly banded deposit interspersed with fine mineral bands. The surface of (609) may have been left exposed for a while before a deposit of gravel (602) containing hearth debris and organic matter was dumped over it (Illus 27.1 & 2). (602) was up to 0.10 m thick and formed a semi-circular patch 4.40 m W-E and 2.70 m N-S which extended into the NE baulk and almost to the E edge of H2 (Illus 30 & 31). On its W side (602) was encircled by a dark, well-humified peat-like material (604) with many mineral inclusions such as fire-cracked stone and cobbles, as well as hearth and food debris. (604) abutted H2 on both its N and S sides (Illus 32) but its full extent could not be confidently traced because it merged in with the amorphous organic layer (601) which covered the S end of the promontory. It may have formed an annulus *circa* 7.4 m in diameter around the structure (Illus 31). (602) and (604) are interpreted as the final floor surfaces of ST2.



Illus 25. Structure 2; plan showing H2, the timber sub-structure [642], the sub-floor [624], the extent of the plant litter floors and the artefacts below the floors



Illus 26. Structure 2; the log sub-floor [624] lies to the left. The section is that drawn in [illus 27.1](#).



Illus 27. Structure 2 sections. 1. main N-S section; 2. main W-E section



Illus 28. Structure 2; the surface of alder logs [642]

A similar build-up of deposits was recorded to the SW of H2, although much less extensive and more poorly preserved. A discontinuous layer of compacted organic material (635), containing distinct layers of compressed plant litter was found moulded over the logs of (642), and probably represents floor coverings (Illus 25 & 27.1). It was sealed by a patch of sandy gravel (606) approximately 2 m across, which contained lenses rich in hearth and food debris (Illus 31). On the E side of H2 was a sequence of organic lens (643) interleaved with gravels (Illus 27.1); again these probably represent organic floor coverings which were repeatedly cleaned and resurfaced. They were sealed under the oak planks (626) which are thought be

the collapsed remnants of H2 (see below). (643) is similar to (636), a sequence of laminated deposits under H2 (see below), and may thus represent the primary floor surface in S2.

H2 consisted of a roughly square arrangement of logs, stacked up to two logs high, 1.80 m across ([Illus 32 & 33](#)). The E side was not well defined and overall the whole structure appears to have collapsed, with much of the building material left scattered about. There were numerous thin carbonised oak planks (626) in and around H2, as well as a concentration of large, angular stone slabs, some of which were stacked in such a way as to suggest that they had slipped off a wall ([Illus 30 & 32](#)). The concentration of the oak planks and stones in and around H2 suggests that they are related to its construction; one of the oak planks was edge-set so perhaps the oak planks lined the box formed by the logs while the slabs formed a fireproof surface capping the wooden components.

H2 was built over a deposit (636) which comprised trampled occupation debris interleaved with bands of gravel and probably represents the first floor surfaces laid down over the primary gravel mound (640). The initial fill of the timber box was a coarse sand (620) rich in general occupation debris including burnt plant litter flooring. This mixture suggests that it represents dumped debris gathered from numerous sources. Over this, a natural peat (616) has been packed in around the sides of the box. Some of the burnt oak planks lay on the surface of (620). Finally a yellow-grey stony gravel (615) containing occupation debris filled the bowl created by the peat. The large angular slabs lay in a collapsed stack over (615). This sequence of deposits suggests efforts to create a raised fireproof foundation but apart from the carbonised planks and some charcoal in (620) H2 displayed no unambiguous evidence that it had been used as a hearth.



If H2 is assumed to be the focal point of the structure and the edge of (642) its perimeter, then the footprint of ST2 would have been roughly 11 m in diameter. The perimeter also appears to be marked by a spread of cobblelike stones (628) which began on the edge of (642) and which are interpreted as a trackway ([Illus 25 & 34](#) – and see below). This arrangement suggests that an entrance into ST2 may have existed at this point.

If ST2 is to be interpreted as a building then there clearly needs to be a superstructure, but although stakes were scattered across its footprint no clear patterning could be detected. There were no large posts around the perimeter of (642) as one might expect, nor was there any clustering of posts around the putative entrance. There was, however a putative line of stakes (617) running NE– SW which might represent an internal partition with ST2 ([Illus 25](#)). It lies along the NW edge of the sub-floor logs (624) at right angles to them but it then just skirts the W corner of H2 and it seems unlikely that an internal partition would lie that close to a hearth. The stakes could not be distinguished from the other stakes scattered across the structure in terms of species or size, ie they were all alder and between 0.10 and 0.14 m in diameter, and they were inserted at different depths into the ground, so it is possible that they simply represent pinning of the substructure (see above) rather than representing superstructural or partitioning supports. The difficulty of making sense of the stakes on the site is exemplified in [Illus 27.1](#) and [27.2](#); Stakes T158 and T159 probably represent infrastructural pinning as they are sealed by the occupation deposits (621), Stakes T160 and T161 have been driven through (621) and must therefore relate to activity on its surface,

while T51, a substantial hazel stake 0.18 m in diameter, has been driven through from the surface of the upper gravel deposit (602) pushing down lenses of gravel with it, and so must relate to activity on its surface. This sequence suggests that each time a floor was resurfaced stakes were also inserted but it is impossible to determine whether these relate to the superstructure, internal divisions or activities within the structure. SF43, one of the board-like wooden objects found under the floor deposits (622/623) had also been pierced by a stake which must relate to building activity which post-dates the initial construction of the building ([Illus 29b](#)).



Illus 29. a. wooden boards SF 35 and SF36 in situ. b. wooden board SF43 pierced by a stake

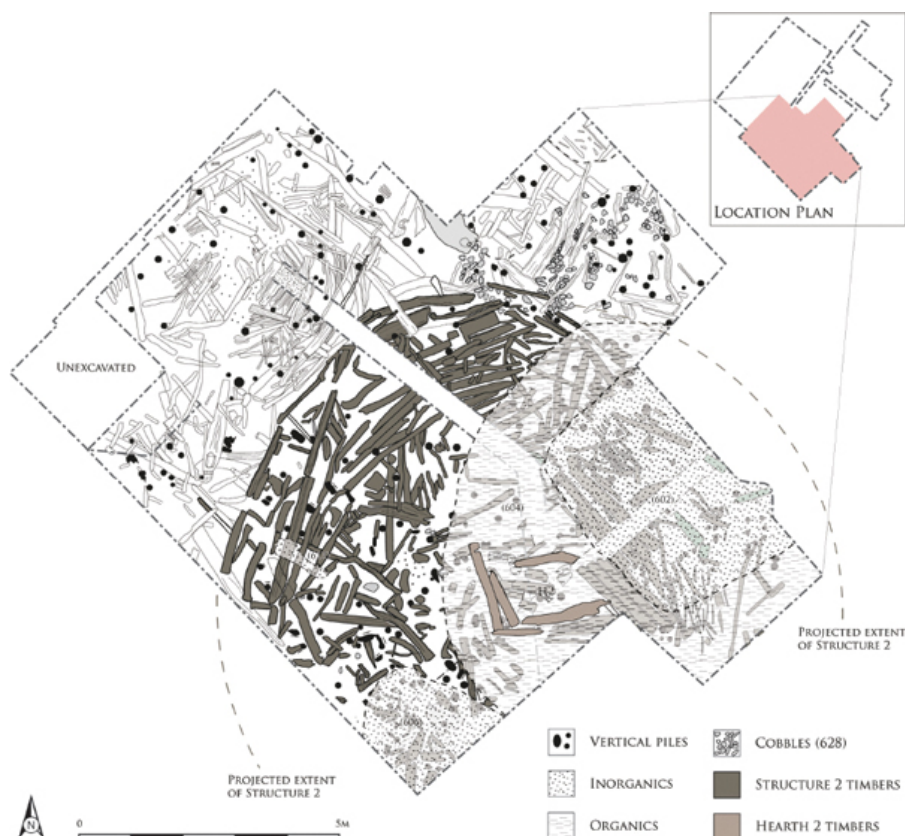


Illus 30. Structure 2; gravel floor surface [602]. Hearth 2, as it first appeared, lies to the top of the photograph

Phase 3; deposits and structures in the N quadrant

Stratigraphically most of the deposits and timber structures in the N quadrant post-date ST1 and pre-date ST3 ([Illus 35.1](#)) so it seems most probable that they are associated with the occupation of ST2, although there is no clear physical relationship between them.

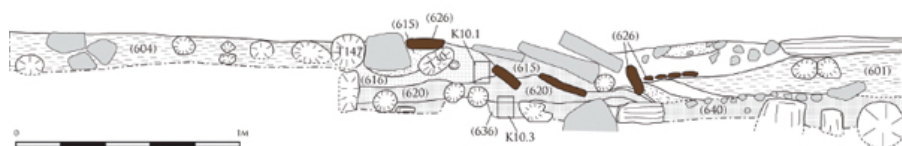
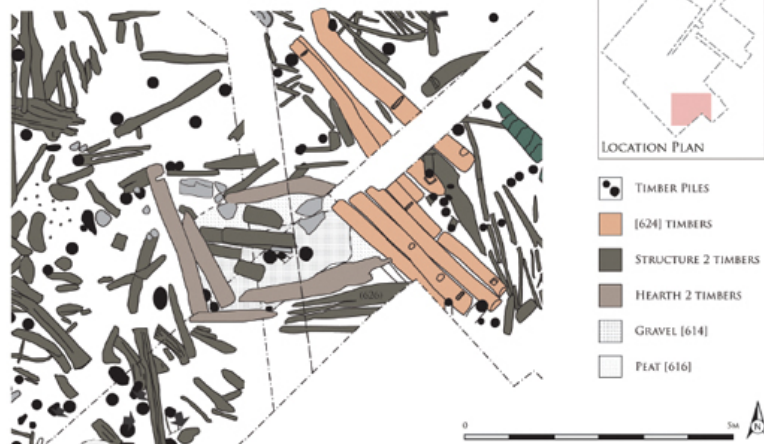
In this quadrant an extensive spread of amorphous organic deposits (512, 515, 516) lay over the basal timberwork (526) ([Illus 35](#)). These deposits were rich in human waste comprising hearth and cooking debris and discarded floor coverings, some of which had been burnt. Small discrete patches of compressed laminar organic material (646) survived across this area ([Illus 35.3](#)), some of them so disturbed that the laminations were almost vertical. Some of these lower deposits probably built up during the occupation of ST1. Over these were multiple deposits of yellow-grey sandy gravel, (501, 502 & 503), interleaved with bands of hearth and cooking debris (ie 504) ([Illus 35, 36 & 37](#)). The overall spread of the gravel deposits was 6.5 m by at least 5.5 m (its full extent to the N was not uncovered) and it was up to 0.25 m deep in places.



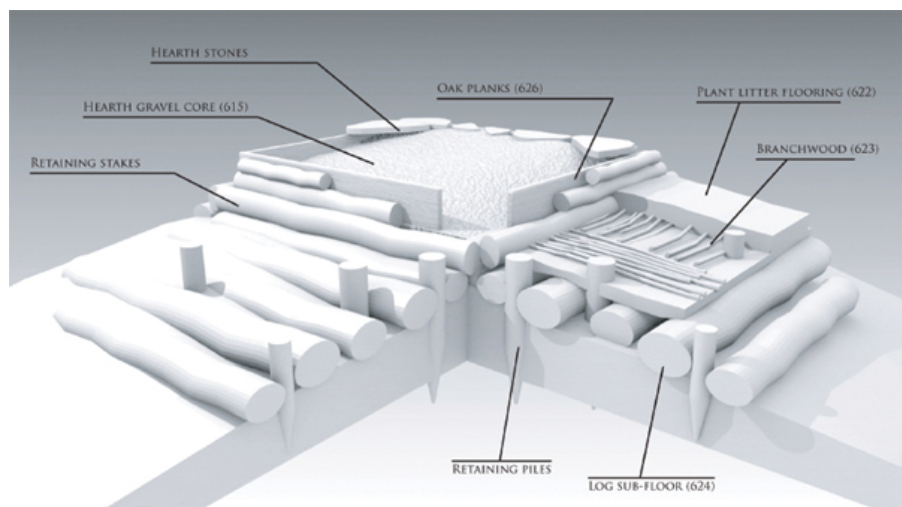
Illus 31. Structure 2; the final floor surfaces [602], [604] & [606]

The largest of the gravel deposits (501) had partially sealed a framework of long alder timbers (645) which extended over the northern half of ST1 ([Illus 37–39](#)). These were amongst the longest timbers found on the excavation and many had partially charred surfaces (see [Chapter 2e](#)). The longest timber, T909 was mortised at both ends, with a stake still *in situ* at one end, and was burnt on both faces so it may have been part of an upright structure when burnt. This interpretation is reinforced by the similarity of its alignment, and many others in (645), with a later timber structure, (644) which had survived partially upright ([Illus 37–39](#)). (644) consisted of a number of oak and alder stakes (ie T947) which had been mortised into long horizontal alder timbers (ie T955). The stakes had collapsed outwards onto the mound of (501). The nature of these timber constructions is discussed below.

Most of the deposits in this quadrant are rich in anthropic content yet there is no convincing evidence for the presence of a structure in the form of hearths or wooden floors. This evidence could lie outwith the excavation boundaries but the proximity of the crannog perimeter, as defined by the stakes (509), would have restricted the size of any structure in this quadrant. The deposits in this quadrant displayed little evidence of trampling or resurfacing so consequently they are interpreted as dumped occupation deposits, possibly the clear-out from hearths and floors over which gravel has been spread. The relationship between the timber structures (644) and (645) with the gravel deposit (501) could thus be explained as follows; (645) represents collapsed walling, which is then covered with dumps of domestic rubbish, including decayed and partially burnt flooring, and hearth clear-out; a new wall (644) is then constructed which also eventually collapses out onto the dumped mounds of rubbish.



Illus 32. Hearth 2. a. plan after removal of upper stones; b. section



Illus 33. Hearth 2; 3D reconstruction of the hearth with surrounding floor layer sequence

The nature of these timber constructions is more like a fence than walling; the only upstanding element consists of two levels of horizontal timbers pinned through mortises by stakes set approximately 1 m apart. Furthermore, the horizontal timbers are long (T909 was at least 3.84 m and many were over 2 m) so if this had formed a perimeter it would have been linear or hexagonal rather than circular. The overall radial and tangential alignment of the

timbers does suggest that ST2 was their focus. Perhaps (644) and (645) were fencelines separating the living spaces from the area where domestic refuse was dumped and recycled (see [Chapter 2f](#)).



Illus 34. Cobbles [628]. The cobbles end just beyond the upper ranging rod, at the junction with the tangentially-aligned timbers [642]. The log sub-floor [624] is just visible in the top left-hand corner

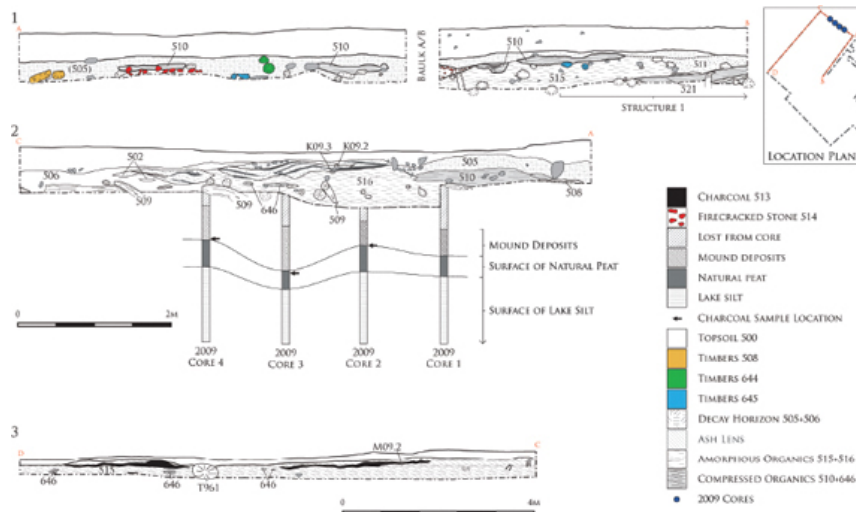
Phase 4; Structure 3

The NE quadrant of the crannog was more mineral-rich than the rest of the site, with extensive inorganic deposits and stone features ([Illus 40 & 41](#)), and perhaps as a consequence organic preservation was poorer. Stratified deposits were very compressed and often only distinguishable in section; compounded with the poor conditions under which the excavation of this area was undertaken (see [Chap 1](#)) it was often impossible to distinguish some of the deposits in plan.

ST3 is later than both ST1 and ST2; some of its structural elements lie over (511), the levelling deposit sealing ST1 ([Illus 21.1](#)), and over the trackway associated with ST2 (see below).

A framework of timbers (106, 218) had been laid down over much of this quadrant, in a very roughly grid-like arrangement; although some of the horizontals had all but rotted away, it was clear that in some cases they had been pinned down by oak pegs which had survived *in situ*. Bundles of hazel brushwood (212) together with other plant litter had been laid down over the horizontal timbers ([Illus 41.1, 41.2 & 42](#)); these survived in small areas where they had lain at right angles to the framework timbers and had become compacted into their upper surfaces. The insect evidence suggests that this may have

been an active floor surface in which a house fauna was able to develop; alternatively decayed floor coverings were used to level and build up the sub-floor surface. Over the brushwood surface was a discontinuous spread of fire-cracked stone (107 = 213 = 514), the boundaries of which were poorly defined (*Illus 35.1, 40, 41.1 & 43*). It had a distinct W edge just beyond the 2007 baulk but elsewhere its boundaries were diffuse; at its maximum extent it was approximately 4.5 m across W/E and 5.5 m N/S. In one area a cluster of approximately 50 small white quartz pebbles (SF 07/05) had been scattered over the surface of the fire-cracked stone (*Illus 40*).

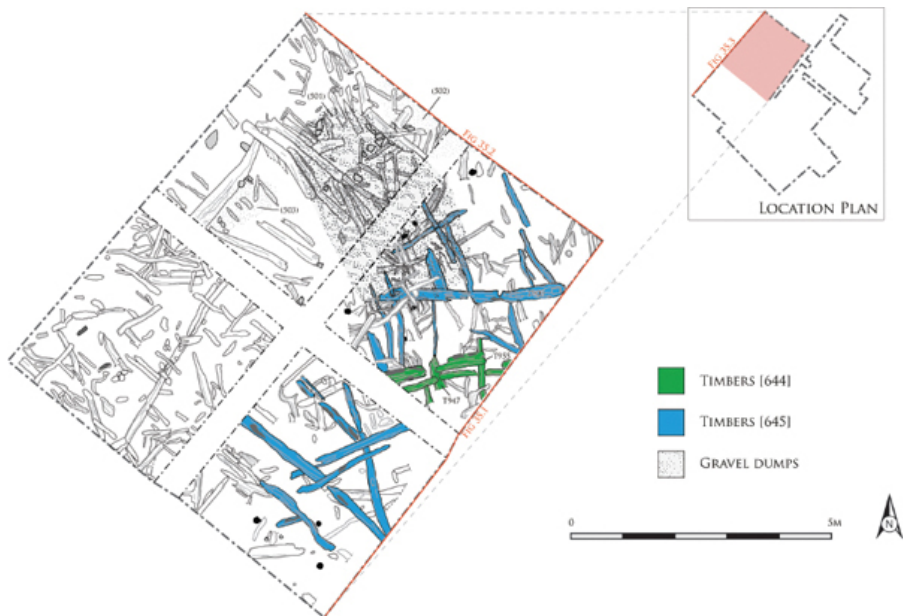


Illus 35. N quadrant sections. 1. E baulk; 2. N baulk; 3. W baulk



Illus 36. Spreads of gravel ([501], [502] & [504]) in the N quadrant. Hearth debris [504] is visible in the centre of the large central gravel spread [501]. Oak stakes [509] can be seen in the upper corner of the trench and along the lower baulk, the frameworks [644] and [645] are just appearing

The fire-cracked stones appear to have formed the sub-floor over which a plant litter floor built up. This compacted laminar organic material (108 = 208 = 510 = 629) had survived as a very discontinuous layer over a wide area, up to 7 m across and up to 0.12 m thick in places. It lies over, as well as merges into (207), an organic-rich layer containing large pieces of decayed wood, lumps of compact 'peat', and heavily flecked with charcoal and burnt bone. Micromorphological analysis shows that (207) and (208) are probably one and the same, the latter simply a better-preserved component of the former. The layers of plant litter were interleaved with fine bands of coarse sand (211), presumably to provide a clean surface on which to lay down fresh plant litter.



Illus 37. N quadrant. Timber frameworks [644] and [645]



Illus 38. N quadrant looking NW. Gravel deposit [501] fully exposed showing its relationship with the timber frameworks [644] and [645]. The long horizontal, T909 (with a mortise at one end), part of framework [645] is partially covered by [501], while framework [644] lies collapsed against the mound of [501]. The partially upright oak stake T947 is inserted into alder horizontal T955



Illus 39. N quadrant looking SE. Timber framework [645] is now fully exposed after removal of gravel spread [501]

To the S and E of the main concentration of plant flooring were spreads of very mixed material (203/206 = 209). These comprised layers of a ginger, charcoal-flecked gravelly sand (203 & 209) mixed with layers of a more organic-rich material (206) and occasional very small patches of grey clay (202). Micromorphological analysis of (206) identified the same laminar plant structure as that in the better-preserved flooring material (208), together with bands of charcoal which had been trampled or blown in rather than burnt *in situ* on the floors. This mixed material probably represents dumps of dirty flooring material. (205), a small amorphous spread of orange gritty clay which lay over (206) is probably part of the same sequence of dumped deposits as (203/206); it contained patches of an organic greasy black deposit, as well as burnt bone (ie SF9) and concentrations of fire-shattered stone, and is interpreted as hearth debris. To the south (203/206) gradually merged into (210), a very homogenous brown peat within which the only features that could be seen were the basal timber framework (218).



Illus 40. Structure 3; plan of features

There were a number of stone features in the NE quadrant which may be related to ST3. On the very perimeter of the crannog in this quadrant, a large oak plank, T192, had been laid down, and over this a deposit of gravel (215), very similar in content and appearance to (203) had been spread. This formed the base for a linear spread of large, angular stones mixed with smaller, rounded stones (214) ([Illus 17, 40 & 41.1](#)). The spread was no more than one stone deep and *circa* 1 m wide and 3 m long, and could perhaps represent a pathway out to the perimeter of the crannog. Its NW end might thus define the perimeter of ST3, in much the same way that (628) does for ST2.

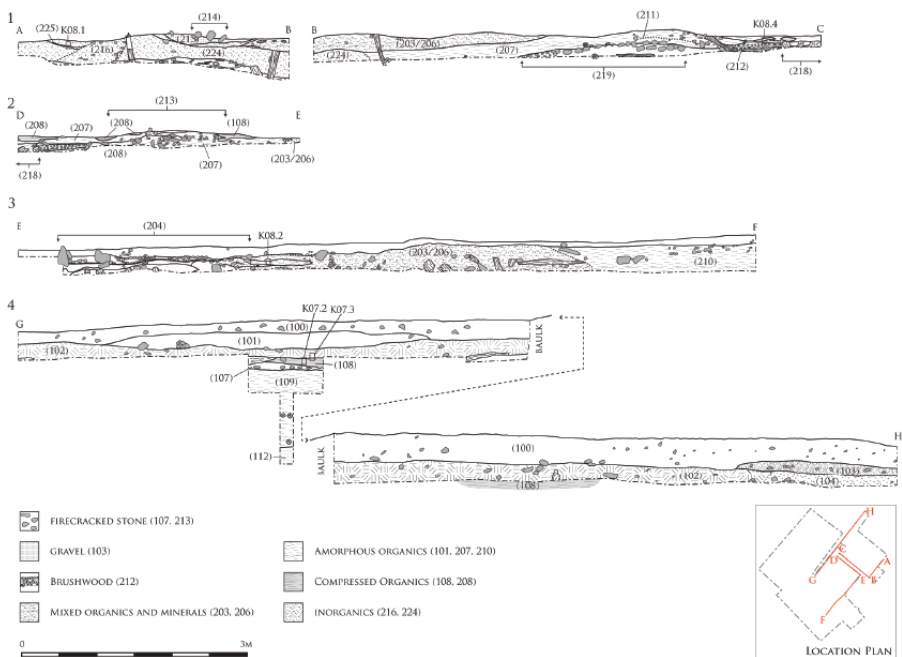
(204), a discrete cluster of large and small stones extending out of the easternmost baulk, emerged as soon as the topsoil had been

removed (Illus 40, 41.3 & 43). It appeared as a hollow oval, 3 m long and at least 1.5 m wide, and was initially thought to be a hearth feature. It lay within (203/206) and there was no evidence for a base or cut, or any kind of structure that one might associate with a hearth (Illus 44). It seems most likely that it is a collapsed structure of some sort and it may be that it is chronologically quite late in the sequence, having ‘sunk’ into (203/206) as the organic deposits decayed.

ST3 had no obvious structural features and no clear focus, like the gravel deposits and the hearth foundations in ST1 and ST2; it survives simply as a build-up of sub-floor deposits and floor coverings. Nonetheless, the analysis of these deposits implies that there must have been a covered structure present (see Chapter 2b).

Phase 5; the decay horizon

An amorphous organic horizon (variously represented by 101, 102, 505, 506, 517, 210, 601) covered most parts of the site. This horizon contained masses of recognisable but badly decayed structural timbers, many inorganic artefacts and other occupation debris, including remnants of plant litter flooring which had decayed *in situ*. It is thus likely that within this decay horizon, there reside the indecipherable remains of *in situ* occupation deposits, probably associated with the structures immediately below them. Scattered across the surface of the horizon were a number of oak timbers (ie T918-20, T3, T23, T58, T172, T173, T246 and T300 – see Illus 13), which although decayed, had survived better than other timbers at this level. Several of these timbers have been dendro-dated; T58 was felled between 435 – 412 BC, T172 has a *tpq* of 501 BC, and T300 has a *tpq* of 468 BC, dates which are roughly contemporary with other dendro-dates from the crannog and therefore do not necessarily represent a later phase of activity on the crannog. It is more likely that they represent the more robust elements of the structures and surfaces that have deliquesced in the decay horizon, and have been left high and dry as the organic components decayed and conflated around them.



Illus 41. Structure 3; sections 1–4

Access onto the crannog

The excavations have demonstrated that the crannog was constructed as a discrete islet some 18 m out into the loch which subsequently became connected to the shore to form the promontory that exists today. Trenches were dug by machine across the neck of the promontory to explore its formation (Illus 45 & 46) but water ingress from both ends of the trenches hampered investigation of the deposits. Nonetheless, it was possible to record timbers (308), both *in situ* oak piles and *ex situ* oak planks, which had presumably formed a causeway from the shore out to the crannog. One of the planks, T962, was probably felled between 452 and 416 BC, so at least one phase of the causeway is contemporary with the main phase of activity on the crannog. However, one of the *in situ* stakes produced a dendro-date of 193 BC so the causeway was rebuilt or refurbished at least two centuries later (Phase 6). The timbers and the amorphous organic deposits (307) in which they had survived were subsequently sealed by a deposit of loose cobbles (306). This was probably deliberately laid down as ‘metalling’ for the causeway, as there is no evidence of the sorting in this deposit which might be expected in a naturally deposited layer. Certainly, the inorganic layers above the cobbles were deliberately laid down to create dry access on to the crannog. These consisted of a grey sand (301), over which a linear arrangement of

sub-angular boulders and smaller stones (302) had been laid down to form the W kerb of a trackway running N-S ([Illus 46](#)). A more diffuse line of boulders (305) may represent the remnants of the E kerb, although this may lie further to the E, and within this an orange-yellow gravelly sand (304) had been spread. This may be the same deposit as the tongue of yellowgrey gravelly sand (103) which protruded into the N end of the 2007 trench. This is interpreted as the final act of consolidation or resurfacing of what was now a trackway onto the crannog. The 2nd century BC stakes may have formed part of a retaining structure for the gravel causeway although this cannot be demonstrated.



Illus 42. Bundles of brushwood [212] visible in front of Section 39.2

Between the terminus of the resurfacing deposit (103) and the perimeter of the crannog, defined by the stakes (105) (see above), there was a gap of *circa* 2 m in which there were no visible timber structures ([Illus 13](#)), at least at the depth to which it was excavated, so there is no evidence as to how the causeway connected to the crannog. A group of four large oak planks (111), up to 2 m long and

0.3 to 0.4 m wide, were found at this junction, in a pile overlapping each other ([Illus 13](#) & 47). Oak planks (508) were also recorded close by, in the NE corner of the 2009 trench ([Illus 13](#)). These are interpreted here as the remains of horizontal plank walling which had collapsed, which may have formed a screen on either side of the entrance on to the crannog. Elsewhere we have proposed that a hurdle fence formed the perimeter of the crannog (Phase 1 – the charcoal spread (513) found along the NW baulk) so the horizontal oak walling may have formed more impressive terminals to this fence at the entrance point.

A trackway across the crannog

A spread of fist-sized cobbles (628) which began at the perimeter of ST2 ([Illus 34](#)) appears to form a trackway across the crannog, from ST2 to the putative access point described above. The cobbles had been laid directly over timbers (605) and were partially retained by timbers on either side, forming a path or track roughly 1.2m wide which was recorded extending NE for at least 3.5 m to the N baulk of the 2010 trench. N of that baulk these lower deposits were only observed in small trenches because wet conditions in 2008 had made much of the excavation area unworkable. However, it seems probable that timbers (226) in this area were the same as timbers (605) and that the vacuous spread of cobble-like stones (219), seen in [Illus 41.1](#) and further north below the timbers of the sub-floor framework (218) of ST3, were a continuation of this trackway. In [Illus 41.1](#) (219) appears as a domed surface 3.3 m across, the stones forming a vacuous mass.

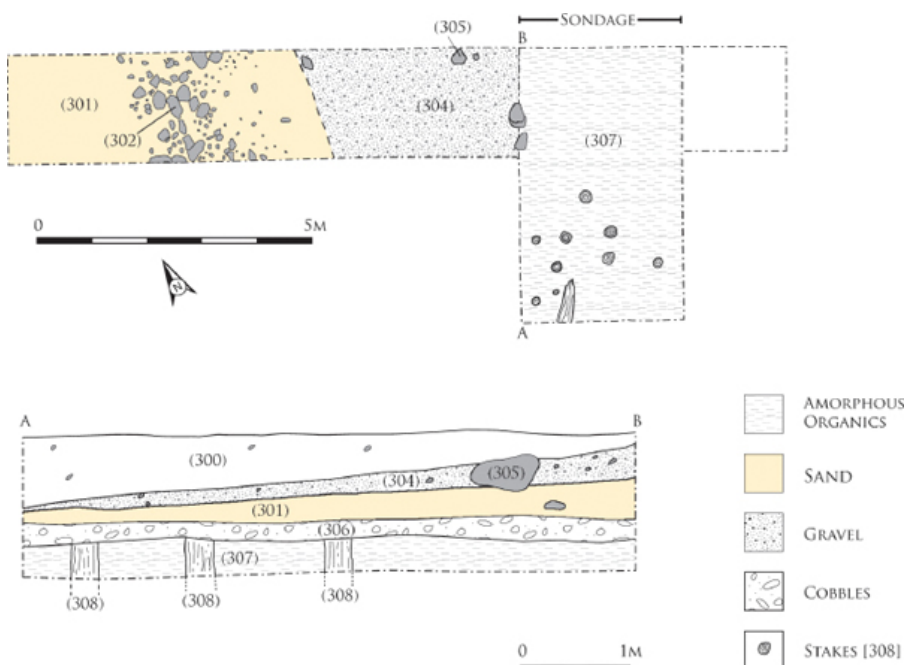


Illus 43. Structure 3 looking SE. The spread of fire-cracked stone [213] lies in the foreground, partially covered by the mixed organic and inorganic material [203/206]. The stone feature [204] lies in the background



Illus 44. Stone feature [204] sitting within [203/206]

This trackway may have been refurbished when ST3 came into use because large roundwood timbers represented by T13–15 were laid down over the cobbles longitudinally along its route and over the perimeter of ST2 (*Illus 31*).



Illus 45. Plan and section of the causeway



Illus 46. One of the machine-dug trenches across the neck of the promontory, looking SE. In the foreground is the stone kerb [302] and beyond that the gravelly sand [304] rises up to form a trackway onto the crannog

The final act?

Immediately under the rushes which cover the crannog was a very stony layer (100=200=500). This layer consisted mainly of small to medium sized water-rolled stones, with some angular stones in a matrix of silty sand; the upper 0.1–0.2 m was rich in fibrous rush roots. This layer was thickest over the northern part of the

promontory where it was up to 0.4 m thick but it decreased in thickness towards the southern end of the promontory where it merged into amorphous organic materials (210=601). Most of it was removed by mechanical digger but inorganic finds were retrieved while trowelling off the residue, SF08/6, a fragment and flake off a shale bracelet, and flints SF07/01 and S08/08. It did not occur in the trenches across the neck of the promontory ([Illus 46](#)) so it cannot represent natural slippage from the slope above the crannog. If it is a deliberately laid deposit it must represent a final resurfacing of the crannog, possibly to provide a landing stage or fishing stance.



Illus 47. Oak planks [111]. The line of three stakes [105] which define the boundary of the crannog on the landward side is visible in the foreground

2B CHRONOLOGY

Introduction

Radiocarbon dating and dendrochronological analyses have been employed to define and refine the chronology of Cults Loch 3. Initially, a suite of radiocarbon dates was obtained to provide a broad chronological framework and these are presented below. Subsequently, the Scottish Universities Environmental Research Centre (SUERC) radiocarbon laboratory initiated a programme aimed at optimizing the radiocarbon wiggle-match dating technique for Scottish Iron Age timbers and the wiggle-match dating of T901 from Structure 1 was undertaken as part of this project (see [Chapter 6](#)). The programme also included postgraduate research, an element of which has focused on the chronological relationship between Structures 1 and 2 (Jacobsson 2015). A brief summary of the results of this research is presented at the end of this chapter, while all the chronological evidence from Cults Loch 3 is used in a Bayesian approach to the overall chronology of the Cults Loch landscape presented in [Chapter 6](#).

Radiocarbon dating

Over the course of the various seasons of work on the crannog, a total of nine samples were submitted for radiocarbon dating ([Table 1](#)). These were taken from all phases of activity on the crannog and encompassed a range of materials; a horizontal timber from the Phase 1 foundation deposits and stakes around the perimeter, a floor timber and bracken from the primary floor surface in Phase 2 ST1, a floor timber and charcoal from hearth debris from Phase 3 ST2, and charcoal from the Phase 3 deposits in the NE quadrant. At this point in the report it is sufficient to note that all the dates are statistically indistinguishable from each other and without any other chronological evidence they would indicate activity sometime between the 8th and 4th centuries BC ([Illus 48](#)). As part of the

postgraduate research by Jacobsson (2015), a further two radiocarbon dates were also obtained on charcoal from occupation deposits in Phase 3 ST2 (SUERC-59317; [Table 1](#)) and Phase 4 ST3 (SUERC-59316; [Table 1](#)). This latter date is statistically distinguishable from the other dates and suggests activity in the 4th to 2nd centuries BC.

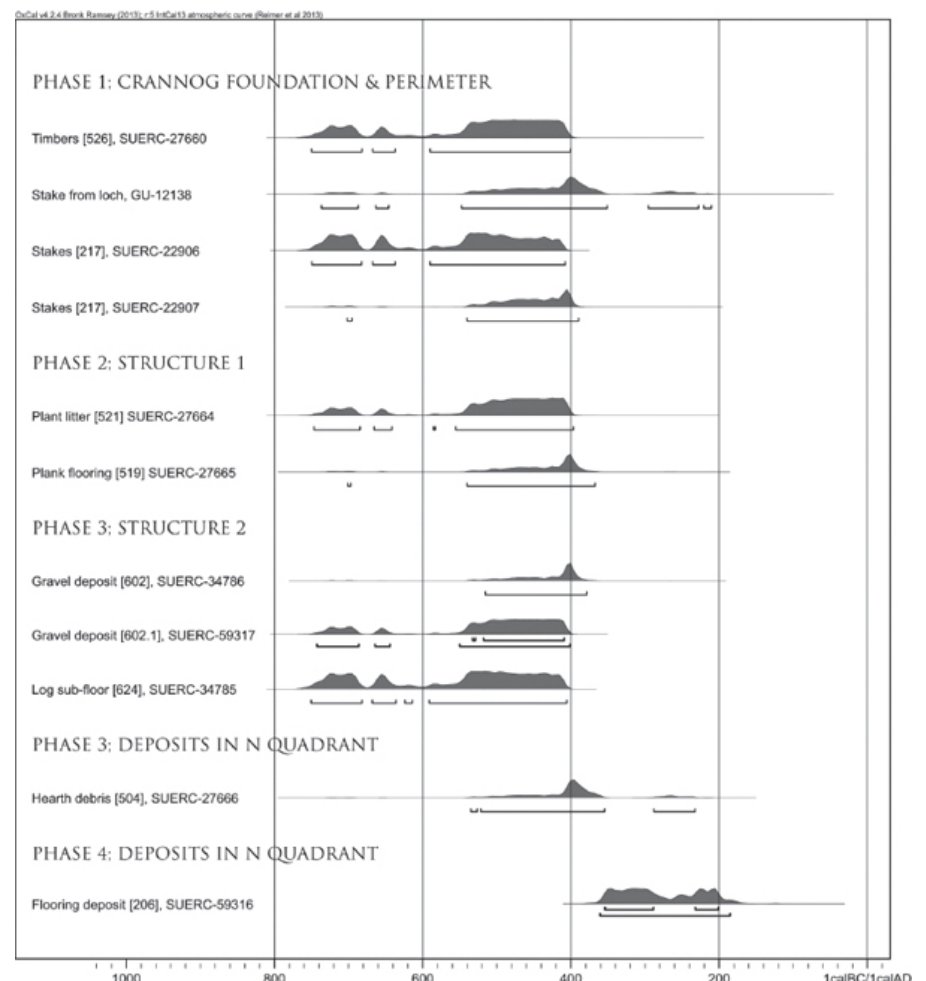
Dendrochronological studies

Introduction

The structural wood assemblage retrieved from the crannog was dominated by two species, alder which comprised 66%, and oak which comprised 28%, of the assemblage. The viability of oak as a dendrochronological species needs no comment here; its reliability has been tried and tested through a half-century of research across Europe and it is the primary species used in dendrochronological studies in the British Isles (EH 1998). In contrast alder has seldom been used, partly because in general it occurs only rarely in archaeological and historical structures, but mainly because it has few of the requisites necessary for successful dendrochronological analysis, namely, a clear and reliable ring-pattern and long growth sequences, the latter making it unlikely that dated reference chronologies could ever be constructed. On the Continent small amounts of alder used in the construction of Alpine pile dwellings have been routinely analysed as part of much larger assemblages of mixed species (cf Huber & Merz 1962; Billamboz 2008), but apart from some exploratory studies on assemblages from sites in the Somerset Levels (Morgan 1976; 1980a; 1980b) only two major studies have been undertaken in the British Isles, both on assemblages from Scottish crannogs (Oakbank – Crone 1988; Buiston – Crone 2000).

On all prehistoric crannogs which have been excavated to modern standards, alder has proved to be the favoured timber for construction, presumably because it was readily accessible around most lochs. At Cults Loch 3 it accounts for 66% of the wood assemblage (see *Structural wood*) and at Oakbank it formed 62% (Crone 1988, 56). It was also the dominant species at Milton Loch 1 (Piggott 1953, 152), Loch Arthur (Henderson & Cavers 2011, 108), Ederline (Henderson 2007, 237) and Erskine Bridge (Crone unpubl). Alder thus offers the most potential to develop relative chronologies for these sites, providing information on phases of construction and repair which could be vital in trying to determine the duration of a settlement, and whether it might have been used seasonally. While the

Oakbank study highlighted the difficulties in using alder and produced only limited results the Buiston study was very successful in producing robust context chronologies which could be tied in stratigraphically to the calendrically-dated oak chronology. The success at Buiston therefore encouraged the idea that chronological resolution on prehistoric crannogs might be achieved, particularly through the combined use of alder and oak.



Illus 48. Cults Loch 3; the radiocarbon dates (graph produced using OxCal v4 1.7 Bronk Ramsey 2010; r5 Atmospheric data from Reimer et al 2009)

The two species have different environmental requirements and growth responses, and so they were initially analysed separately.

The oak timbers

The assemblage

The surviving ring-sequences on all of the sampled oak timbers were recorded, either by counting or measuring. [Illus 49](#) graphs the lengths of the recorded ring-sequences but it is not an accurate representation of the age structure of the assemblage. The majority of the ring-sequences are incomplete, either because the timbers were so decayed that the sapwood and an unknown number of heartwood rings had been lost (the bark edge survived on only a third of the sampled timbers, mostly on the stakes – [Table 2](#) & [Illus 49](#)), or because of the manner in which they had been converted from the tree. For instance, T23 is a plank converted from a chord cleft off the trunk (see [Chapter 2e](#)) and only 58 rings remain of a sequence which is estimated to have been over 100 rings in length. Furthermore, many of the longer sequences displayed bands of severely compressed growth ([Table 2](#)) and were consequently very difficult to measure. T923 could not be reliably measured and on many of the other sequences, multiple radii, none of which spanned the full ring-pattern present, were measured in an effort to establish a continuous reliable sequence. For these sequences, the number of growth-rings present is therefore a minimum. Nonetheless, the assemblage is comprised mostly of young roundwood timbers; even with the addition of missing sapwood rings over 50% of the assemblage is probably under 50 years of age and as much as 70% is probably under 80 years of age.

Table 1. Cults Loch 3; radiocarbon dates

Lab ID	Sample ID	Context	Species	Material type	$\delta^{13}\text{C}$ (‰)	Radiocarbon age (BP)	Calibrated radiocarbon date cal BC (95% confidence)
<i>Phase 1; crannog foundation & perimeter</i>							
SUERC-27660	T963	Horizontal timbers [526]	<i>Alnus glutinosa</i>	waterlogged wood	-28.4	2420±35	760–400
GU-12138	-	Stake from loch	<i>Quercus</i> sp.	waterlogged wood	-26.4	2340±50	520–260
SUERC-22906	T207	Stakes [217]	<i>Quercus</i> sp.	waterlogged wood	-24.9	2440±25	760–400
SUERC-22907	T294	Stakes [217]	<i>Alnus glutinosa</i>	waterlogged wood	-27.0	2375±30	520–390
<i>Phase 2; structure 1</i>							
SUERC-27664	F521	Plant litter flooring [521]	<i>Pteridium</i> sp.	waterlogged plant macrofossil	-25.7	2405±35	750–390
SUERC-27665	T922	Plank flooring [519]	<i>Alnus glutinosa</i>	waterlogged wood	-28.0	2355±35	520–380
<i>Phase 3; structure 2</i>							
SUERC-34786	F602	Gravel deposit [602]	<i>Corylus avellana</i>	charcoal	-24.6	2355±30	490–380
SUERC-34785	T934	Log sub-floor [624]	<i>Alnus glutinosa</i>	waterlogged wood	-24.3	2435±30	760–400
SUERC-59317	F602.1	Gravel deposit [602]	<i>Alnus glutinosa</i>	charcoal	-27.7	2415±29	743–402
<i>Phase 3; deposits in N quadrant</i>							
SUERC-27666	F504	Hearth debris [504]	<i>Corylus avellana</i>	charcoal	-25.3	2330±40	480–360
<i>Phase 4; structure 3</i>							
SUERC-59316	F206.1	Flooring deposit [206]	<i>Corylus avellana</i>	charcoal	-27.4	2193±26	361–186

Of the 60 sequences examined 46 were fully analysed; those with less than 30 rings present were deemed too short for analysis. The assemblage was undertaken in two stages. All those sequences over 80 rings were analysed together first, so that as robust a site chronology as possible could be developed and dated. Subsequently, all the remaining sequences, those between 30 and 80 rings, were compared against the site master and against each other, to identify any further significant correlations.

Results

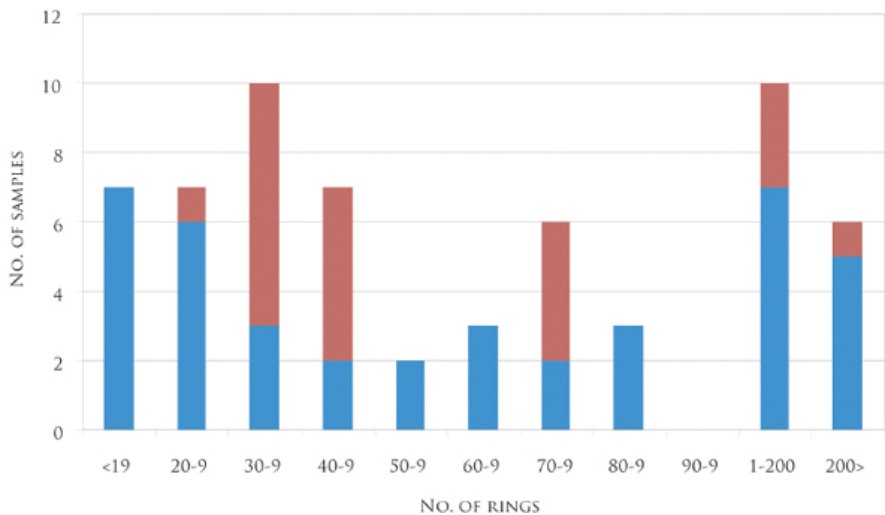
Analysis of the assemblage was undertaken using statistical correlations generated by the ‘Dendro’ suite of programs (Tyers 1999) and verified by visual cross-matching. Crossmatching proceeded in a stepwise fashion, using the strongest internally replicated group to form the kernel of a site master chronology first and then comparing that chronology with the remaining unmatched sequences to find further acceptable statistical and visual matches.

Table 2. Oak; dendrochronological data

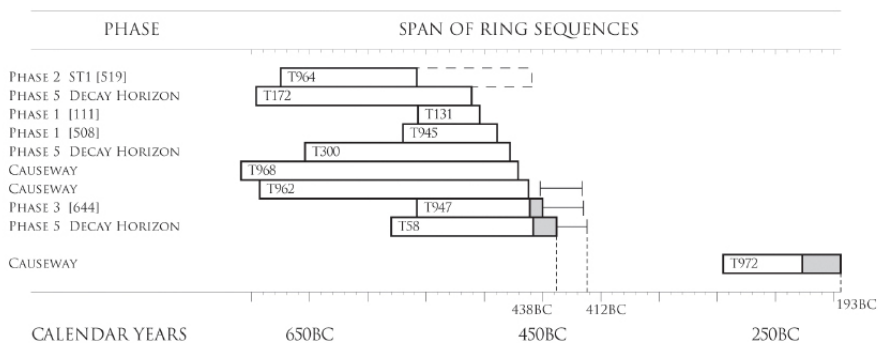
<i>T.no.</i>	<i>Context</i>	<i>Conversion</i>	<i>No. rings</i>	<i>Sapwood rings</i>	<i>Outer rings</i>	<i>Calendar date BC</i>	<i>felling date/range BC (10–46 yrs)</i>	<i>Comment</i>
22	605	A	65		1			
23	601	E	58		h/s?			
32	642	E	81		+			V compressed ring-pattern
58	601	A	143	20 ± 3	1	580–438	435–412	bands of v compressed rings
67	/	A	73	50	be			
101	/	A	40	23	be			
110	642	A	81		+			
131	/	D	54		1	557–504	tpq 494	
153	/	A	54	3	+			
172	218 (111?)	B?	186		+	696 511	tpq 501	
173	200	A	119		nr h/s?			
192		E/2B	74		nr h/s?			
195	217	A	76	33 ± 1	be			
202	217	A	34		h/s?			
207	217	A	43		be			
214	217	A	72	32	bc			
220	217	A	35		be			not measured: too fast-grown
246	218	A	69		h/s?			
300	218	B?	177		+	654–478	tpq 468	
327	217	A	31	all	be			
331	217	A	30	17	be			
901	518/530?	A	135		h/s?			
918	507	A	72		h/s			
920	507	A	38	13	bc?			
923	519	E	200		+			V compressed ring-pattern. Not measured
927	519	E	220	24 +	be			V compressed ring-pattern
934	509	C	46		h/s?			
935	509	A	63+1	variable	be			
936	509	A	41	21	be?			
937	509	A	49	22	bc			
938	509	B?	63		+			
940	509	A	33		h/s			
941	509	A	34	18	be			
942	509	A	31	13	be			
944	526	A	123	45	be			assymetric growth around stem
945	508	E?	82		+	570–489	tpq 479	
947	644	A	109	11	1	558–450	450–415	
949	S11	C	43	9	bc?			
959		A	33 + 2	all	be?			
960		A	32		h/s			
961		A	137		+			v fast-grown ring-pattern
962	308	B?	232		h/s?	693–462	452–416	V compressed ring-pattern
964	519	B?	213	9	+	675 558	tpq 548	V compressed ring-pattern
			(118 ms)					
968	308	B?	239		+	709–471	tpq 461	
970	308	A	125	22	be?			bands of v compressed rings
971	308	A	71	13+ 2	bc?			
972	308	A	102		be	295 194	193	

KEY: be – bark edge; h/s – heartwood/sapwood boundary; – 1 – rings missing

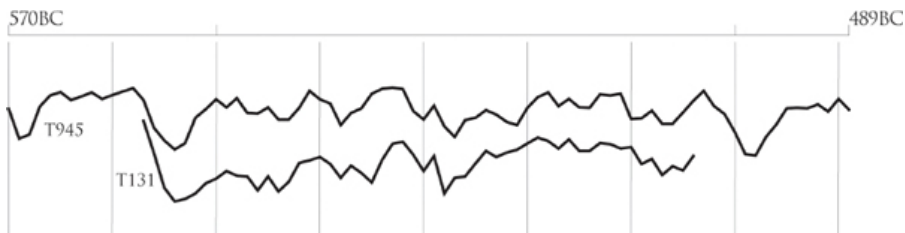
This approach generated a group of nine sequences which were combined into a site chronology, CLMNx9, 272 years in length (Illus 50). Table 3 shows the internal correlations of the components and the stages by which the chronology was constructed. T131 has been included in the site chronology because, although it is short and compared well statistically with only one other component, T945, the visual correlation with this sequence was very convincing (Illus 51). Furthermore, its inclusion in the site chronology generated improved correlation with the dated master chronologies against which it was compared.



Illus 49. The age structure of the oak assemblage



Illus 50. CLMNx9; the chronological relationships between the dated oak timbers



Illus 51. The visual correlation between tree-ring sequences from T131 and T945

Table 3. CLMNx9; t-value matrix

	T962	T968	T172	T300	T945			
T962	/					]	]	]
T968	9.22	/				]	]	]
T172	8.01	5.46	/			]	CLMNx5	]
T300	6.6	6.17	5.05	/		]	]	]
T945	4.92	4.24	3.8	4.47	/	]	]	CLMNx8
T947	4.61	–	–	3.96	–	5.53	]	CLMNx9
T58	–	–	–	–	4.01	5.07	]	]
T964axx	4.63	4.28	4.38	–	–	5.53	]	]
T131	–	–	–	–	5.19		4.15	]

Table 4. CLMNx9; correlations with other Iron Age chronologies

<i>Master chronology</i>	<i>Chronological span of master chronology</i>	<i>CLMNx9 @ 709–438 BC</i>
BLC7000 (7272 years) <i>Pilcher et al 1984</i>	5289 BC–1983 AD	5.79
GARRY BOG 2 (in BLC7000) <i>QUB data</i>	947–229 BC	5.8
IRELAND BC/ AD* <i>QUB data</i>	872 BC –313 AD	5.7
<i>CLONAD</i> <i>QUB data</i>	668–504 BC	4.5
<i>SHARRAGH</i> <i>QUB data</i>	671–492 BC	4.6
<i>KILLORAN</i> <i>QUB data</i>	870–193 BC	4.7
SUTTON COMMON, Yorkshire <i>I Tyers pers comm</i>	597–362 BC	3.52

*this chronology contains all sites in italics

CLMNx9 and the remaining individual sequences were then compared against all available prehistoric master chronologies from Britain and Ireland. CLMNx9 produced significant correlations with Irish chronologies in particular, dating it to 709–438 BC (Illus 50 & Table 4).

As T947 and T58 retained some of their sapwood rings it is possible to calculate a range within which the timbers were probably felled (Table 2 & Illus 50). The curvature and alignment of the outer rings on T962 suggests that the outermost measurement lies on the heartwood/sapwood boundary and it thus also possible to calculate a felling range for this timber. Using the oak sapwood estimate for the British Isles of 10–46 years (EH 1998) these three timbers were all probably felled sometime in the third to fifth decades of the 5th century BC. T964 had a very difficult, compressed ring-pattern and only the earliest half of the sequence was considered reliable so this is what is included in the site chronology. However, there are at least another 90–100 rings including nine sapwood rings after the last measured ring (Table 2); allowing for errors in the latter half of the sequence T964 was probably felled sometime after 461 BC, and probably in the same decades as the other sequences with surviving sapwood. The remaining five sequences in CLMNx9 are all from planks or plank fragments, and the surfaces of these were too decayed to be certain about the outermost rings.

T901 could not be dendrochronologically dated but it has been wiggle-match dated (see Hamilton *infra*) and the modeled felling range is 489–413 cal BC (95.4% probability); this range encompasses that of the dendrochronologically dated timbers described above.

Table 5. T972; correlations with other Iron Age chronologies

<i>Master chronology</i>	<i>Chronological span of master chronology</i>	<i>T72 @ 295– 194 BC</i>
DORMANS	323–153 BC	6.05
ISLAND (DIMNx7)		
DIMNx7		4.85
component - T1		
DIMNx7		5.26
component - T7a		
DIMNx7		4.92
component - T7b		
DIMNx7		5.89
component - T12		
LOUGH	272–187 BC	4.39
MACNEAN		
LOGBOAT		
QUB data		
DORSEY (Co. Armagh)	575–116 BC	4.15
QUB data		

NAVAN (Co. Armagh)	275–126 BC	3.66
QUB data		
DERRAGHAN	415–167 BC	3.61
MORE		
QUB data		

Only one other sequence could be reliably dated against the master chronologies. T972 produced significant correlations with the site chronology from nearby Dorman’s Island and its components (Cavers *et al* 2011), dating it to 295–194 BC (Table 5). This date was confirmed by low but consistent correlations with some of the Irish chronologies. T972 retains the bark edge and a ring is just beginning to form beyond the last measurement. Thus, the tree was felled in the spring of 193 BC.

There were a few pairs of acceptable correlations amongst the remaining sequences. The sub-masters are labelled *QSP* (*Quercus* sp.) followed by a number (which relates to the order in which the masters were constructed and is not significant) then the number of components in the sub-master. The length of the sub-master is given in brackets.

QSP1x2 (63 yrs); This contains T935 and T937 which compare well statistically ($t = 4.38$) and visually (Illus 52a), and were felled in the spring of the same year, although only T935 displays the beginning of springwood growth.

QSP2x2 (33 yrs); This contains T942 and T959 which compare well statistically ($t = 4.14$) and visually (Illus 52b). There may be a difference of a year or two between their felling; the outermost rings of T959 were compressed by decay and it is possible that a further 1–2 unmeasured rings were present.

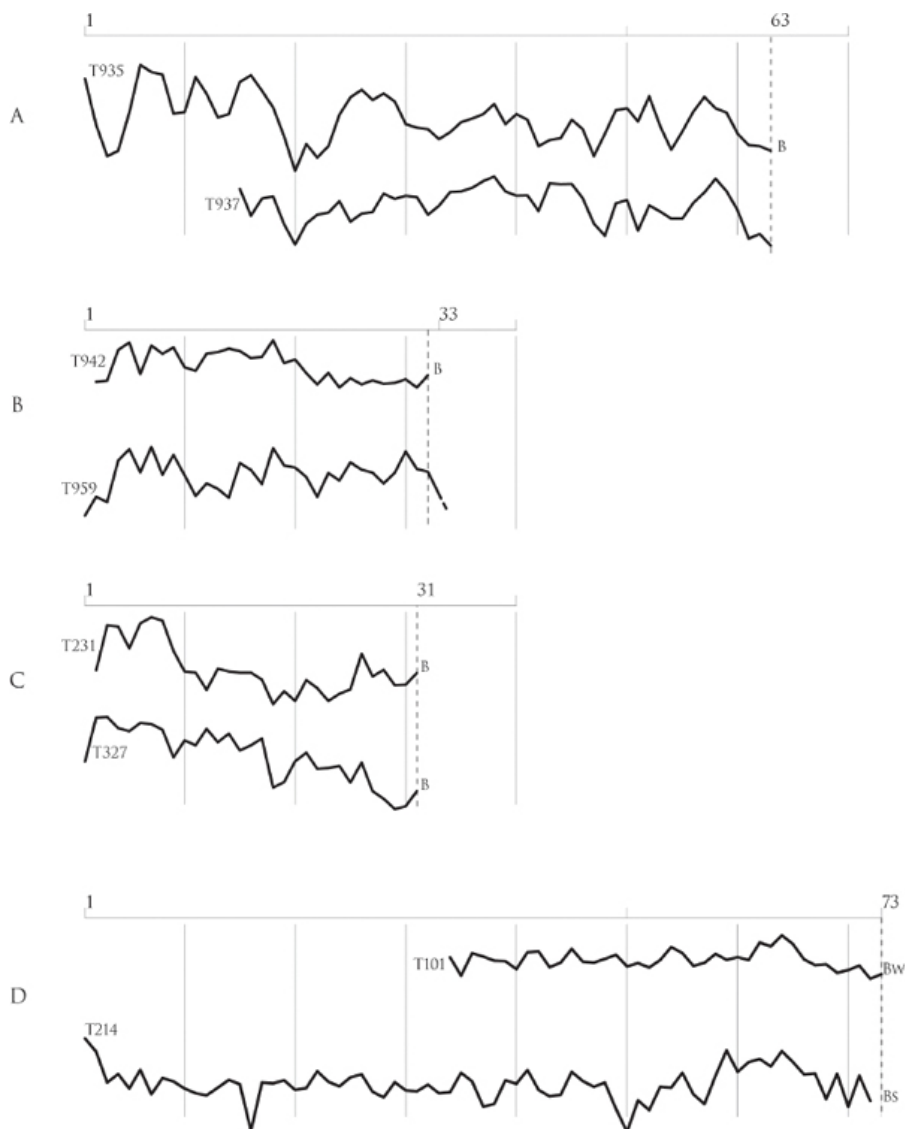
QSP3x2 (31 yrs); This contains T327 and T231 which correlate well visually (Illus 52c) although less well statistically ($t = 2.47$). Both were felled in the same year.

QSP4x2 (73 yrs); This contains T214 and T101 which correlate well visually (Illus 52d) although less well statistically ($t = 2.13$). Their chronological relationship suggests that they were felled in the same year but possibly in different seasons.

Masters were constructed for these pairs and compared with the rest of the assemblage but this yielded no further correlations and the pair-masters remain undated.

Archaeological interpretation

Dendrochronological analysis has demonstrated that there was building activity on the crannog in the latter half of the 5th century BC and later in the early 2nd century BC. The absence of surviving bark edge on any of the components of the site chronology, CLMNx9 means that the precise chronological relationships between the timbers cannot be defined. Of those with surviving sapwood T964 is a plank fragment within (519), used to resurface the floor within the Phase 2 ST1 ([Illus 23](#)), whilst T947 is a stake in the Phase 3 framework (644) ([Illus 37](#)) which may have been a fenceline in the N quadrant associated with ST2. The dendrochronological relationships between these timbers suggest that no more than a few decades at most separate the construction of ST1 and ST2, unless of course, T947 was re-used. T58 was also felled within the same few decades as those timbers in ST1 and ST3. It was lying in the Phase 5 decay zone over (602) ([Illus 13](#)), the final floor surface within ST2, and therefore provides a *terminus ante quem* for ST2. T58 could have been re-used but its date still implies that the only sources of timber available for re-use were those felled in that short period of time. This suggests that all the episodes of building activity on the crannog, represented by the construction of the three structures, are not separated by any length of time, a few decades at most. The estimated felling range for T962, one of the planks found lying around the causeway stakes, and therefore assumed to be part of that structure, also suggests that the causeway was built within the same timespan. T972, an *in situ* stake in the causeway, was felled in 193 BC so the structure must have been renovated some two centuries later.



Illus 52. Visual correlations between pairs of tree-ring sequences of oak: a. QSP1x2; b. QSP2x2; c. QSP3x; d) QSP4x

All the other dated timbers in CLMNx9 (with the exception of T968, a plank from the causeway) were fragmented planks lying in the decay zone and cannot be related to any specific structure. It is worth noting, however, that T131 compares well only with T945, both from contexts interpreted as forming a barrier on either side of the entrance onto the crannog, (111) and (508) respectively ([Chapter 2a](#)).

The pairs of matching oak sequences contribute some evidence for the structural development of the crannog ([Illus 53](#)). QSP1x2 and QSP2x2 are comprised of stakes from the cluster on the NW perimeter of the crannog; unsurprisingly, QSP1x2 indicates felling in the same

of less than 30 rings were deemed too short for analysis so samples were initially counted to determine length. Some 28 timbers were rejected on this basis. Thus, 82 samples were fully analysed (Table 6).

Many of the longer sequences displayed very compressed growth-patterns, particularly in the outermost rings, and were consequently very difficult to measure. Despite the measurement of multiple radii on samples with compressed patterns it has often proved impossible to resolve uncertainties in the ring-patterns. Where multiple radii have been measured and the correlations are good a raw mean was compiled. Many of the samples were also distinguished by pronounced asymmetric growth around the stem.

Results

The approach outlined above has not resulted in the construction of a single coherent site chronology for the alder. Only one large group of internally consistent sequences has emerged, together with pairs of sequences which also correlate well together. The sub-masters are labelled ALSP (*Alnus glutinosa*) followed by a number (which relates to the order in which the masters were constructed and is not significant) then the number of components in the sub-master. The length of the sub-master is given in brackets.

ALSP1x10 (65 yrs); There is strong internal consistency amongst the components of this sub-master (Table 7). The bark edge was present on all components but T129 (Illus 54). A partially formed, and therefore unmeasured ring was present on T48, T60 and T137 indicating that they had also been felled in the same year as T62, T113, T117, T146, T53 and T138.

Table 6. Alder; dendrochronological data

<i>T no.</i>	<i>Context</i>	<i>No. rings</i>	<i>Outer rings</i>	<i>Component of</i>	<i>Comment</i>
2	638	142	be		
5	605	77	?		outer rings decayed
11	605	47	be?		
12	605	78	be		
16	614	93	+ 4 be		outer rings decayed
19	605	93	be?		
24	642	86+	be		outer rings compressed
25	642	36	be?		
27	642	32	be		
28	642	35	be?	<i>ALSP2x2</i>	outer rings compressed
29	642	75	be		
33	603	39	be	<i>ALSP5x2</i>	
34	624	35	+ 1/2 to be	<i>ALSP6x3</i>	
35	624	73	+ 1/2 to be	<i>ALSP6x3</i>	
36	624	77	+ 1/2 to be	<i>ALSP6x3</i>	
37	624	85	be	<i>ALSP4x3</i>	bands of narrow rings
39	630	81	+ 1/2 to be?		
40	630	68	be		
41	630	94	be		
44	630	44	be		
45	S	46	+ 1/2 to be		
45	630	53	be?		
46	642	38	be		
47	605	82	be		
48B3	S	79	+10 unnm be		outer rings compressed
48B4	S	55	+ 1/2 to be	<i>ALSP1x10</i>	
50	S	60	+ 1/2 to be		
52	S	40	+ 1/2 to be		
53	S	40	+ 1/2 to be	<i>ALSP1x10</i>	
55	S	55	be		
57	S	45	+ 1/2 to be		
59	S	65	+ 1/2 to be	<i>ALSP3x2</i>	
60	S	64	+ 1/2 to be	<i>ALSP1x10</i>	
62	617	40	be	<i>ALSP1x10</i>	
63	S	122	+ 4.5 unnm to be		
64	S	62	be	<i>ALSP3x2</i>	
67	S	62	+ 1/2 to be		
100	S	49	be		
106	S	31	+ 1/2 to be		
107	642	44	be		
109	S	48	+ 1/2 to be		
113	S	39	be	<i>ALSP1x10</i>	
115	617	68	be		
117	S	31	be	<i>ALSP1x10</i>	
119	642	37	be		
120	S	62	+ 1/2 to be?		
126	S	66	be?		
127	S	40	be		
128	S	42	+ 1/2 to be		
129	S	35	be?	<i>ALSP1x10</i>	outer rings decayed
130	642	58	be		
131	642	45	be?		
134	S	31	be		
135	S	60	be	<i>ALSP4x3</i>	
136	605	110	+ 5 unnm to be?		
137	S	43	+ 1/2 to be	<i>ALSP1x10</i>	
138	S	38	be	<i>ALSP1x10</i>	
140	642	48	be		
144	S	42	be	<i>ALSP5x2</i>	
145	S	39	+ 1/2 to be		
146	603	38	be	<i>ALSP1x10</i>	
147	603	96	+ unnm to be		outer rings decayed

149		605	88	+ unm to be		
151	S	33	be?			outer rings damaged
194	217	71	be			
222	217	69	be			bands of narrow rings
293	217	45	+ 1/2 to be			
320	226	32	be	ALSP4x3		
321	226	83	be			
328	217	51	be			
909	644	74+	?			outer rings decayed
914	526	105+	?			outer rings decayed
916	526	61	+ 1/2 to be			
932	507	61+	?			outer rings decayed
933	507	47	be?	ALSP2x2		
946	S	43	?			outer rings decayed
948	S	42	be			
954	644	43	?			outer rings decayed
956	626	69	be			
963	526	78+	?			outer rings decayed
966	525	75	+ 1/2 to be			
967	525	92	be			

KEY: be = bark edge; +1/2 to be = an incomplete ring present before bark edge; unmeasured rings

Table 7. ALSP1x10; t-value matrix

	T146	T48B4	T53	T60	T62	T113	T117	T129	T137	T138
T146	/									
T48B4	3.26	/								
T53	5.18	3.54	/							
T60	4.17	4.36	3.74	/						
T62	4.75	3.26	4.98	3.67	/					
T113	3.4	4.06	3.94	4.46	3.85	/				
T117	6.82	—	4.88	3.63	5.18	4.67	/			
T129	5.74	5.21	5.1	3.26	4.6	3.87	3.23	/		
T137	—	4.99	—	—	3.57	4.07	4.22	7.56	/	
T138	6.74	4.21	7.5	3.18	7.41	3.51	5.47	6.35	5.5	/

ALSP2x2 (47 yrs); This contains two sequences, T933 and T28 which compare well statistically ($t = 5.25$) and visually ([Illus 55a](#)). The correlation indicates that they were both felled in the same year.

ALSP3x2 (66 yrs); This contains T59 and T64. Although the statistical correlation is relatively low ($t = 3.56$) visual agreement is good ([Illus 55b](#)) indicating that both timbers were felled in the same year.

ALSP4x3 (74 yrs); This contains T37, T135 and T320. They all compare well together, both statistically ([Table 8](#)) and visually ([Illus 55c](#)). As all components retain the bark edge the chronological relationships between them indicate that T320 was felled in Relative Yr 42, T135 was felled 22 years later in Relative Yr 64, and T37 was felled 10 years after that in Relative Yr 74.

ALSP5x2 (42 yrs); This contains T33 and T144. The statistical correlation between the two sequences is good ($t = 5.14$), as are the visual correlations ([Illus 55d](#)). Both sequences retain the bark edge indicating that they were felled in the same year.

ALSP6x3 (77 yrs); This contains T34, T35 and T36. T35 and T36

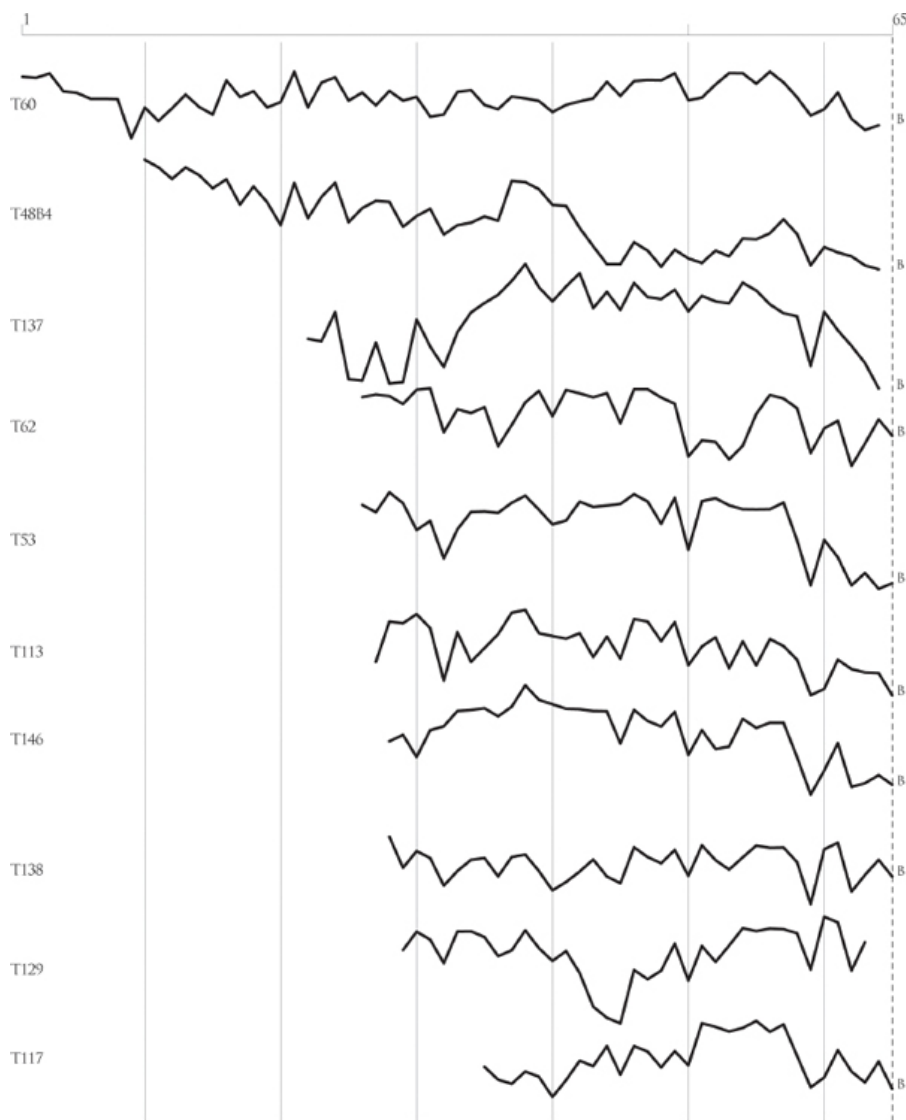
compare very well together, both statistically ($t = 7.9$) and visually ([Illus 56a](#)) and were felled in the same year. They are both half-logs and may well be from the same tree. T34 did not produce significant statistical correlations when compared with either T35 or T36. However, if the outermost year of T34 is aligned with that of T35_36mn (the mean curve from the two sequences), on the assumption that all three timbers were felled at the same time, the visual agreement is acceptable ([Illus 56b](#)) although the t -value is low ($t = 1.19$).

Table 8. ALSP4x3; t-value matrix

	T135	T320	T37
T135	/		
T320	5.01	/	
T37	4.58	4.01	/

Archaeological interpretation

All the samples in the largest chronology, *ALSP1x10* are from stakes which lie within the footprint of ST2, except for T53 and T48 which lies within the circuit of ST1 ([Illus 53](#)). As they were found under both structures, this suggests that these stakes relate to the construction of the crannog mound rather than to the construction of either structure.

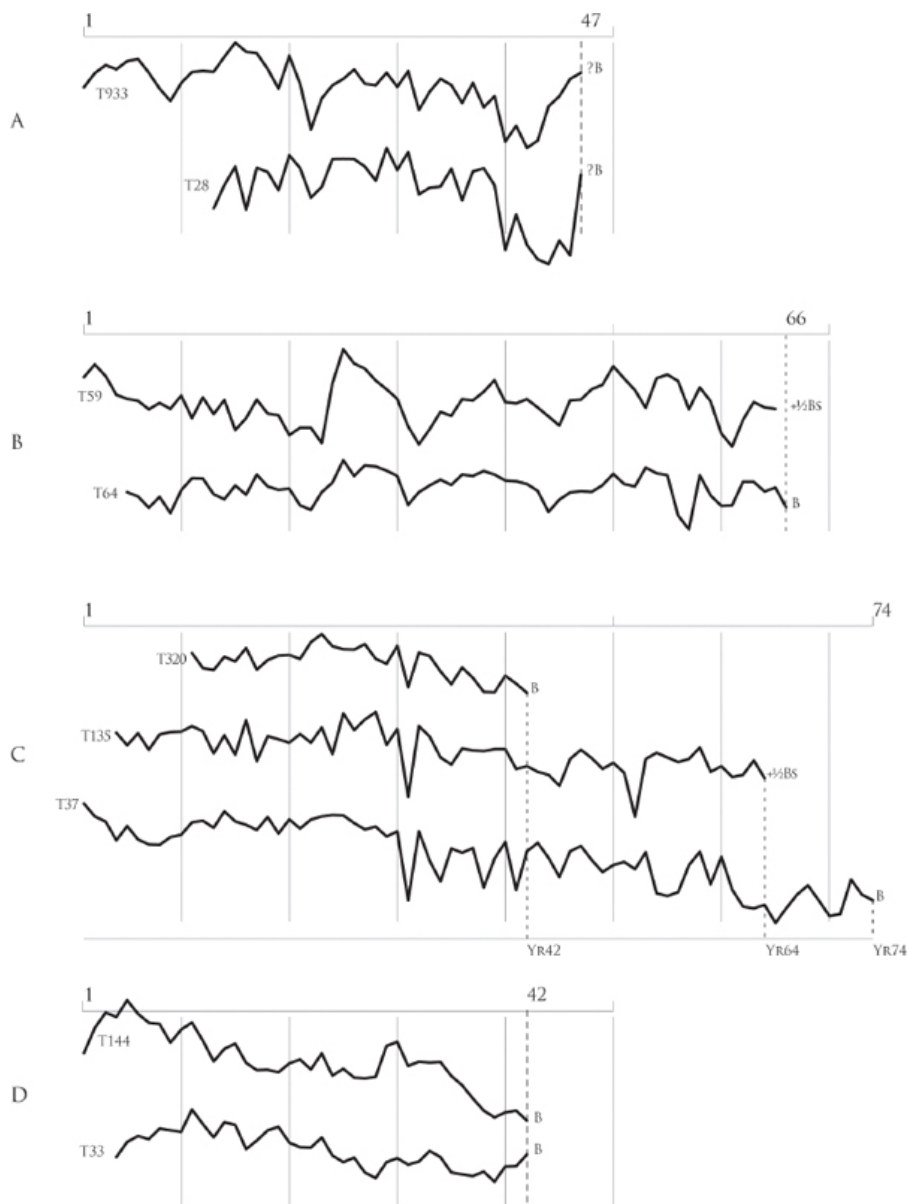


Illus 54. Visual correlations with ALSP1x10

Most of the other groups include timbers which lie within the footprint of ST2 but none correlate with *ALSP1x10*. These include *ALSP3x2* which contains two stakes, T59 and T64, sealed below (602), the final floor surface of ST2 and *ALSP6x3* which contains T34, T35 and T36, horizontal timbers forming the sub-floor (624). Given their location the assumption is that they all form part of the construction of ST2 but again there are no correlations between the groups. Either the construction events are separated by periods of time that are greater than the length of the sequences, which in most cases is at least one generation, or the timbers are contemporary but coming

from very different micro-environments (see below).

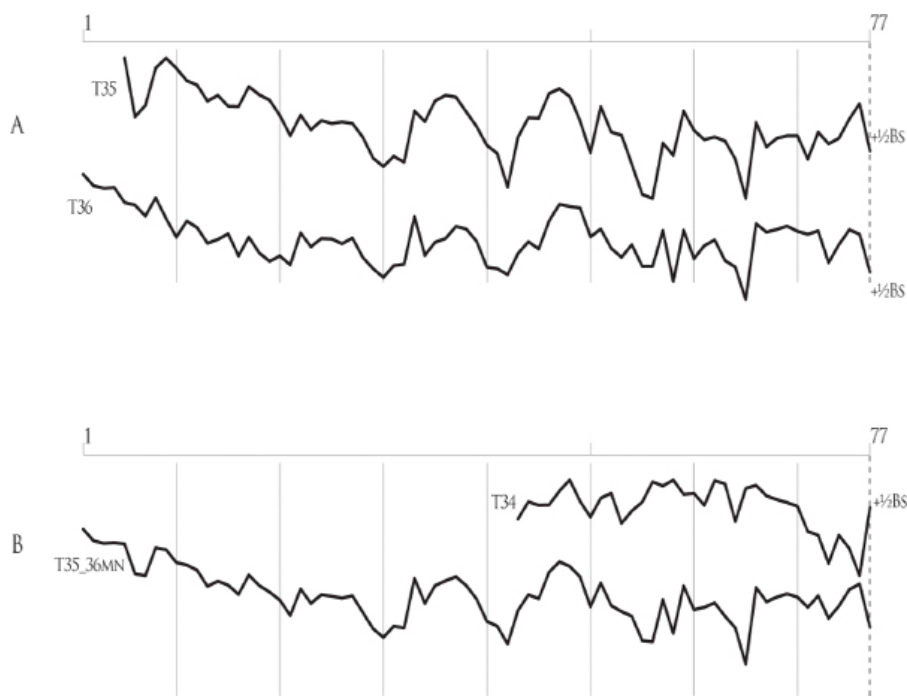
The other groups provide some information about chronological relationships across the site. The implication of the chronological relationship in *ALSP2x2*, between T933, a horizontal timber within ST1 and T28, a horizontal timber within in ST2, is that, as they were felled at the same time, they probably represent foundation timbers laid down across the site at the same time. T33, a timber in H2, the hearth foundation at the centre of ST2, and T144, a stake to the east of the cobble trackway, (628) were also felled at the same time (*ALSP5x2* – [Illus 55d](#)). This implies that T144 is related to the superstructure on the crannog as it was being inserted at the same time as H2 was being constructed.



Illus 55. Visual correlations between pairs of tree-ring sequences of alder: a. ALSP2x2; b. ALSP3x2; c. ALSP4x3; d. ALSP5x2

The only chronological relationships which indicate a significant lapse of time between building events are those in *ALSP4x3*, between T37, a horizontal log in the floor of ST2, T135, a stake on the periphery of ST2, and T320, one of the horizontal timbers (226) under ST3 (*Illus 55c*). Allowing for the possibility of missing outer rings (see below) these imply that T320 was laid down *c* 22 years before T135 was inserted. As ST3 is stratigraphically later than the other structures

this suggests that T320 is part of the foundation structure of the site and not related specifically to the construction of ST3. T37 was felled and incorporated in the floor in ST2 c 32 years after the foundation of the crannog was laid down.



Illus 56. Visual correlations within ALSP6x3

Correlations between the oak and alder sequences

The two species were compared with each other. There were no convincing correlations between the dated oak chronology, CLMNx9 and any of the alder sequences so none of the latter has been calendrically dated, but there were a number of pair correlations which were visually and statistically acceptable.

T971 (oak) & T52 (alder) This correlation ($t = 6.1$; [Illus 57a](#)) suggests that T971, one of the stakes in the causeway, was felled 25 – 27 years after T52, a stake under ST1.

T936 (oak) & T293 (alder) This correlation ($t = 5.0$; [Illus 57b](#)) suggests that T293, one of the band of stakes around the NE perimeter of the crannog, was felled 9 years later than T936, one of stakes around the NW perimeter.

T67 (oak) & ALSP1x10 (alder) This correlation ($t = 5.48$; [Illus 57c](#)) suggests that T67, a stake in ST2 was felled 20 years later than all

the stakes in ALSP1x10 which are also within the footprint of ST2. T961 (oak) & T41 (alder) This correlation ($t = 5.24$; [illus 57d](#)) suggests that T41, a horizontal timber in ST1, was felled 19 years after the outermost surviving ring on T961. There was no surviving sapwood on T961, the large oak log found by the E baulk, but the curvature of the surviving surface suggests that it is close to the heartwood/sapwood boundary. It is thus feasible that T961 was felled at the same time as T41, or at least within a few years.

Summary & discussion

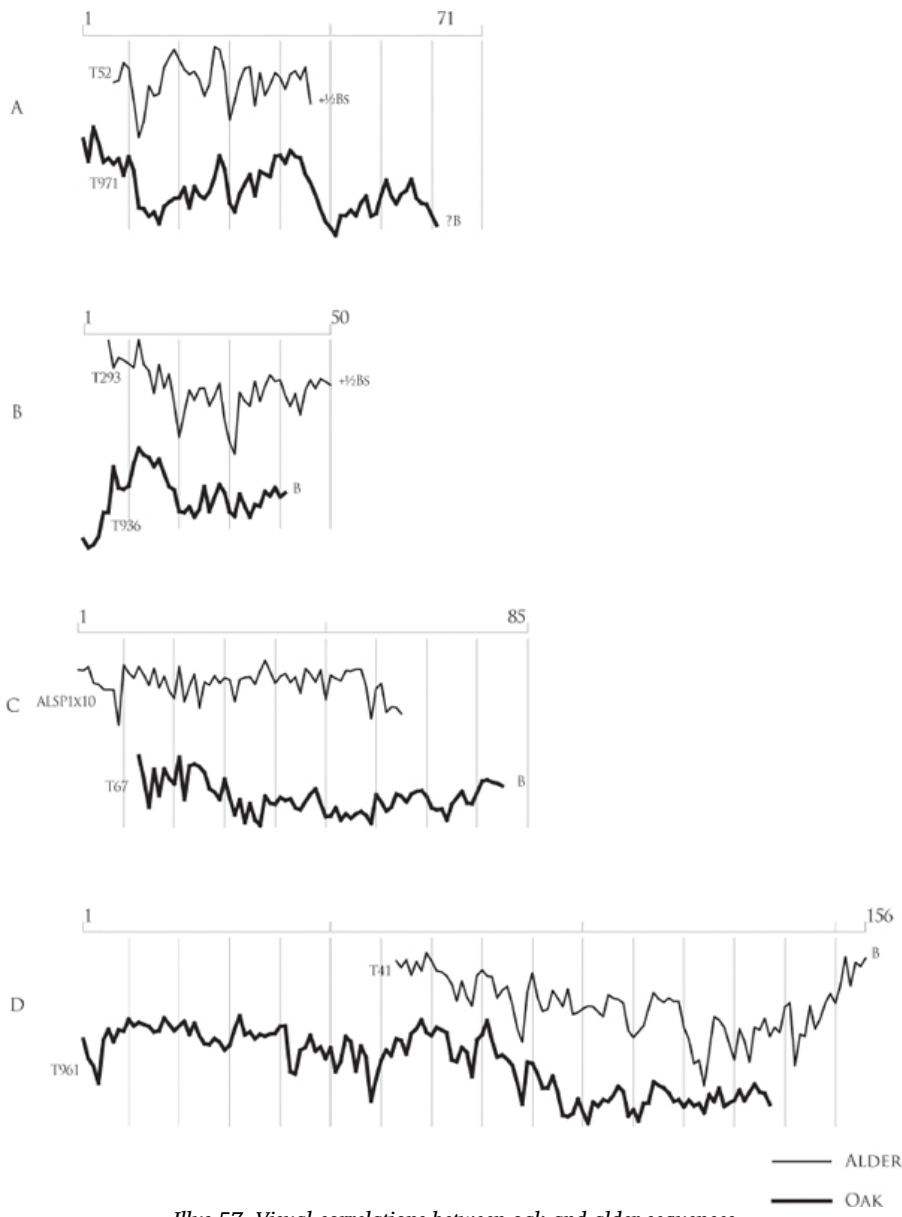
The dendrochronological analysis of the oak and alder assemblages from the crannog has yielded a calendrically dated oak chronology, an undated alder chronology and some undated correlations between pairs of both species. The significance of these results is discussed in this section.

The site chronology

The chronological and stratigraphic relationships between the dated oak timbers indicates that most of the building activity on the crannog, in particular the construction of the three structures and the causeway, all occurred within the space of a few decades in the latter half of the 5th century BC. The relationships between the alder timbers in ALSP4x3 corroborate this, suggesting that the foundation timber T320 was laid down some 32 years before the subfloor (624) in ST2. If we estimate another few decades to encompass the numerous reflooring episodes in ST2 before its abandonment, the subsequent construction of ST3 and its use, then the building and occupation of the crannog may have lasted little more than half a century.

Some of the chronological relationships support the thesis that many of the stakes relate to the pinning of the foundation deposits and not the superstructure, for instance those in ALSP1x10 and QSP4x2 in which stakes within the footprint of ST2 were felled in the same year as stakes within the footprint of ST1 and on the NE perimeter. Other relationships indicate that stakes were being frequently inserted, either to renew the pinning or because they formed part of the superstructures on the crannog. For instance, the relationship between ALSP1X10 and the oak stake T67 suggests that the latter was inserted 20 years after the alder stakes were used to pin down the foundation deposits, while the relationship between T923 and T936, both stakes

around the perimeter, suggests that the former was inserted 9 years after the latter.



Illus 57. Visual correlations between oak and alder sequences

If T52 is interpreted as a stake pinning the foundation deposits then its relationship with T971 suggests that work was being undertaken on the causeway 25–27 years after the crannog foundations were laid down. T52 could form part of the superstructure of ST1 but as this is thought to be the earliest structure built on the site then the difference

in date between building the crannog foundation and building ST1 is unlikely to be great. It seems most likely that T971 represents repairs to the causeway rather than its initial construction. T972 must represent refurbishment of the causeway over two centuries later in the early 2nd century BC.

The oak dendrochronology

Cults Loch 3 is only the second prehistoric site in Scotland to be dendrochronologically dated, the first being Dorman's Island, a crannog in Whitefield Loch, some 11 km to the east of Cults Loch (Cavers *et al* 2011). The success in dating these two sites lies in their proximity to northern Ireland and northern England (Table 4), areas with similar climatic conditions which have produced dated tree-ring chronologies spanning the later prehistoric period. The existence of two dated 1st millennium BC chronologies in SW Scotland means that the dendro-dating of other contemporary assemblages in the region should now become easier; for example, the date for T972 would not have been accepted without the corroboration against the Dorman's Island chronology and its components (Table 5).

The dendro-dated timbers from Dorman's Island all came from a single structure (Cavers *et al* 2011, 83) so it was not possible to comment on the duration of activity on the crannog. However, at Cults Loch 3 the dated oak timbers are scattered throughout the stratigraphy of the site and the chronological relationships between these timbers, and between some of the alder timbers, suggests that, with the exception of the building event in the early 2nd century BC, all building activity occurred over a period of a half-century at most in the late 5th century BC. It is, of course possible that later phases of building activity used only non-oak timbers which have subsequently decayed, but the likelihood that the crannog was constructed and occupied for a relatively short period of time is consistent with the dendrochronological evidence from many other wetland sites (Barber & Crone 2001, 72–3). In many of the Alpine pile dwelling villages, buildings were often used for between only 5 and 20 years before being replaced, while entire settlements were occasionally relocated after only a few decades (Suter & Schlichtherle 2009, 32). Even the longest-lived Alpine lake settlements survived in the same location for no more than 50–100 years (*ibid*). This pattern has also been observed at Buiston, an Early Historic crannog in Ayrshire, where the occupation of the site lasted 80–90 years at most, during which time at least two, and probably three roundhouses were built, one replacing

the other (Crone 2000, 66).

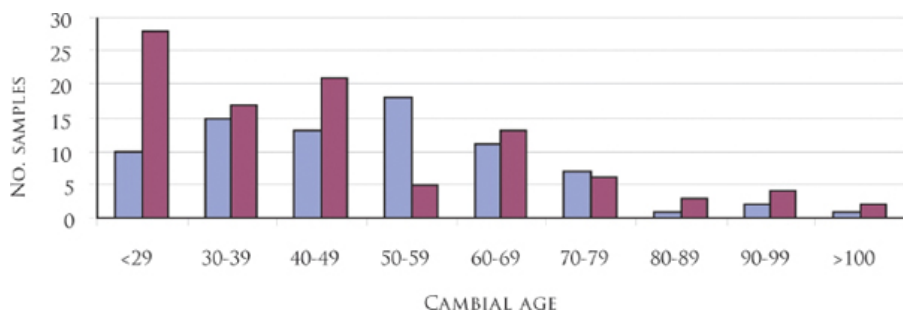
In a recent evaluation of the dating evidence for Scottish crannogs (Crone 2012) the author has suggested that the dendro-dates from Cults Loch 3 and Dorman's Island form part of emerging evidence, together with radiocarbon and wiggle-match dates, for 'event horizons' in the 5th and 2nd centuries BC, when people chose to build out on the water. In other words, the accumulating evidence suggests that crannogs were not being built and used continuously throughout the 1st millennium BC; instead, there were discrete pulses of crannog-building activity (ibid 163). This has a profound bearing on our interpretation and understanding of the promontory crannog within its landscape and so the significance of and reasons for these 'event horizons' will be more fully explored in [Chapter 8](#).

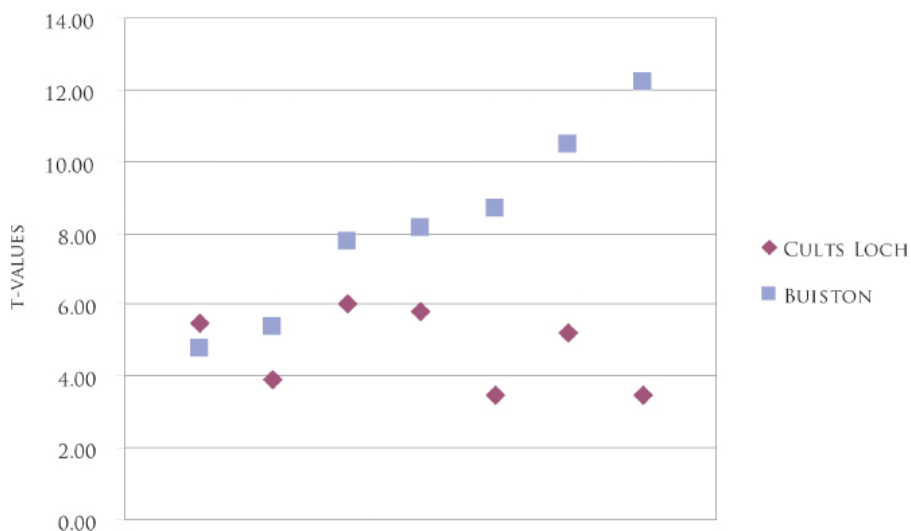
The alder dendrochronology

The alder assemblage from Cults Loch 3 is the third such assemblage from a Scottish crannog to be analysed (see above). For the Early Historic crannog at Buiston, robust chronologies for each of the contexts with alder were constructed, each context chronology containing between six and nine sequences (Crone 2000, 51–3; Tables 13–17). All five context chronologies correlated well together (ibid Figure 129 & Table 18) and a site chronology, 116 years in length was constructed. The resulting chronological relationships between the contexts provided vital information about the structural history of the crannog (ibid 54). The results from Oakbank, a crannog of comparable date in Loch Tay, are quite similar to those from Cults Loch 3. Analysis produced multiple small groups, or Blocks of between two and 13 sequences with good internal correlations, and some of the Block masters correlated well with each other but an overall site chronology could not be constructed with any confidence (Crone 1988, 134, 169–70). In summary, a single cohesive chronology could be built at Buiston whereas at Cults Loch 3 and Oakbank only multiple small chronologies could be built. The assemblages from Cults Loch 3 and Buiston are compared below in an attempt to determine what characteristics are needed for successful chronology construction and what this means in terms of the nature of the woods and woodland used at both sites.

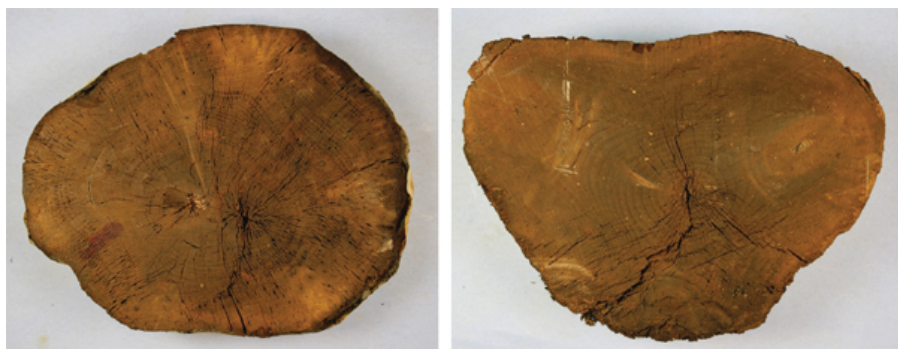
Firstly, the assemblages were similar in size and age. Although there were more timbers under 30 years of age at Cults Loch 3, the size of the analysed assemblage (ie excluding the <30 year timbers) was very similar, 68 timbers at Buiston and 71 at Cults Loch 3, and of

those 94% and 87% respectively were under 80 years of age ([Illus 58a](#)). The major difference lies in the morphology of the timbers themselves. At Buiston the samples displayed very little asymmetry, and this is reflected in the high intrastem correlations between the measured radii ([Illus 58b](#)). At Cults Loch 3 multiple piths and pronounced asymmetry of growth ([Illus 59](#)) was a common feature, again reflected in the intra-stem correlations, noticeably lower than those from Buiston. Furthermore, many of the Cults Loch 3 samples displayed a dramatic decrease in ring-width in their outermost rings ([Illus 60](#)), to the extent that some could not be measured (see above), but none of the alders from Buiston displayed a similar growth pattern (Crone 2000, 53). This pattern of increasingly suppressed growth generally reflects stressed, competitive conditions and can lead to cessation in growth (Elling 1966, 163). It has been observed in samples from alders fringing Loch Tay (Crone 2000, 117) and in alder coppice (ibid 143). These combined characteristics are indicative of a differing growth structure. At Buiston the alder probably came from dominant single-stemmed, maiden trees; indeed the squared alder posts in two of the palisades were amongst the largest timbers recorded on the crannog (Crone 2000, 18). At Cults Loch 3 the alder probably came from multistemmed trees with a more coppice-like form, the kind of structure observed in carr woodland fringing lochs. These observations suggest that the structure of the parent tree may have a significant bearing on the dendrochronological viability of alder.

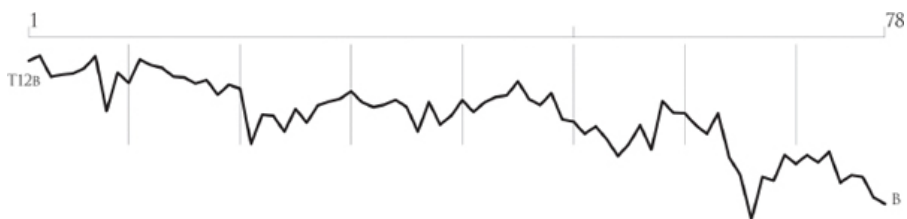




Illus 58. a. The age structure of the alder assemblages from Cults Loch 3 and Buiston Crannog; b. A comparison of intra-stem correlations from Cults Loch 3 and Buiston Crannog



Illus 59. Sections through alder samples T60 (a) and T113 (b) showing asymmetric growth and multiple piths



Illus 60. Graph of tree-ring sequence from T12 showing decrease in growth in last 15 years

Other factors may also have contributed to the successful analysis at Buiston. The overall coherence of the assemblage, reflected by the strong internal correlations between the components, suggests that all the timber was probably coming from the same source, a woodland that was exploited over a relatively short period of three decades, and may even have been managed (Crone 2000, 54). The modern alder

stand on the shores of Loch Tay displayed a similar level of internal coherence, which was attributed to the fact that it came from a single environmental niche (Crone 1988, 119). Conversely, assemblages displaying numerous small chronologies, such as those from Cults Loch 3 and Oakbank, may reflect multiple woodland sources.

Finally, one other possible explanation for the difficulties in constructing an alder chronology at Cults Loch 3 must be explored. There may be no correlation because there is no synchronicity amongst the alder sequences; this would be the case if the intervals between felling episodes was greater than the length of the sequences. For instance, felling episodes separated by 30–40 years would not be detected amongst sequences of similar span. However, this seems improbable at Cults Loch 3; the dated oak chronology suggests that all the building activity occurred within a half-century at most and within that time at least three structures were built. One might therefore anticipate felling episodes associated with the construction of the structures of between 10–15 years at the very least. As all the alder comes from deposits associated with the dated oak it seems unlikely that it was felled at intervals which could not be detected with the length of sequences available.

In conclusion, the work at Cults Loch 3 has crystallised some of the issues relating to the use of alder as a dendrochronological species. Firstly, it suggests that the structure of the parent tree is an important factor. In Elling's dendrochronological study of modern alder stands in Germany he observed that trees overshadowed and/or stressed by competition with neighbouring trees displayed very irregular ring-patterns with increasingly suppressed growth (1966, 163). In multi-stemmed trees there will inevitably be dominant stems and overshadowed stems, and the characteristics observed by Elling were also seen in multi-stemmed trees growing on the shores of Loch Tay (Crone 1988, 107).

Secondly, assemblages with wood from multiple sources will always be more problematic, displaying poor internal correlation and hindering chronology construction. This can also be the case with oak but the climatic signal is so strong in oak growth that these problems can generally be overcome by direct correlation of individual sequences against dated master chronologies. The work of Douša *et al* and others (2009, 9–10) indicates that local environmental factors rather than climate are more critical to the radial growth of alder and this would explain why we encounter low correlation within an assemblage from diverse woodland sources.

Nonetheless, while we must conclude that the analysis of timbers

from multi-stemmed trees from diverse sources is likely to be problematic, it can still produce correlations which contribute to the site chronology, as is the case at Cults Loch 3.

¹⁴C wiggle-match dating and the structural sequence at Cults Loch 3

Piotr Jacobsson, Derek Hamilton & Gordon Cook

Introduction

Between 2012 and 2015, Scottish Universities Environmental Research Centre (SUERC) undertook a project to evaluate the potential of the radiocarbon wigglematch dating technique (Bronk Ramsey *et al* 2001) in the context of Scottish wetland settlement. Wiggle-match dating of timbers takes advantage of the fact that each tree-ring has a radiocarbon signature of the year in which it was formed and hence it is possible to date multiple rings or groups of rings from throughout the length of the timber and obtain a picture of a small section of the past radiocarbon trend. This trend can then be fitted to the internationally ratified calibration curve (at the time of the project this was IntCal13; Reimer *et al* 2013) and because the number of places where the two will match is limited, the precision of the date will improve. In the context of the wiggle-match dating project, the uncertainty regarding the relationship between Structure 1 (ST1) and Structure 2 (ST2) (see [Chapter 2a](#)) provided an opportunity to evaluate whether the technique can cope with not only providing dates for construction events, but also work as a means of resolving questions on site formation that could be used on other sites.

The analysis took place in two steps. In the first step, a model that described the relationship of material within the structures, but made no assumptions about their mutual relationship, was built. This served to identify plausible scenarios without imposing any specific order upon the data. Then, in the second step, these scenarios were expressed as site models, including all the available data, and compared to one another, so as to evaluate their plausibility and implications for the interpretation of the sequence of events at Cults Loch 3. What follows is a summary of these parts of the wiggle-match dating project that are of immediate importance to the interpretation of the internal site formation; for further detail and the underpinning data see Jacobsson (2015).

Method

All of the timbers used for wiggle-match dating were pre-treated using a slight modification of the laboratory's standard protocol for alpha cellulose isolation (Dunbar *et al* 2016). The main modification lay in the reduced concentration of the alkali used during the acid-alkali-acid (AAA) part of the process (2% rather than 17.5% NaOH). This is motivated by the difficulty in retaining sufficient sample material for analysis when using the strong alkali. The pre-treated cellulose was then combusted, graphitized and measured using the techniques summarized in [Chapter 6](#). The charcoal samples were pre-treated using the acidalkali-acid technique as described by Dunbar *et al* (2016). The dendrochronological determinations within the models are identical to Crone (see above) and, where possible, use is made of the relative alder chronologies. All of the statistical analyses were conducted in OxCal 4.2 (Bronk Ramsey 2009) using the IntCal13 calibration curve (Reimer *et al* 2013).

Results

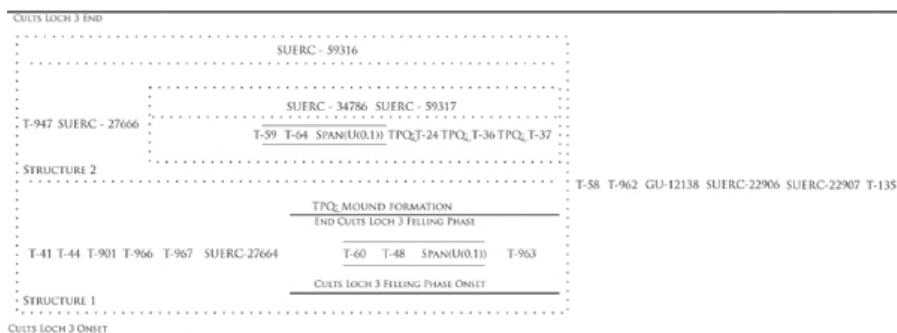
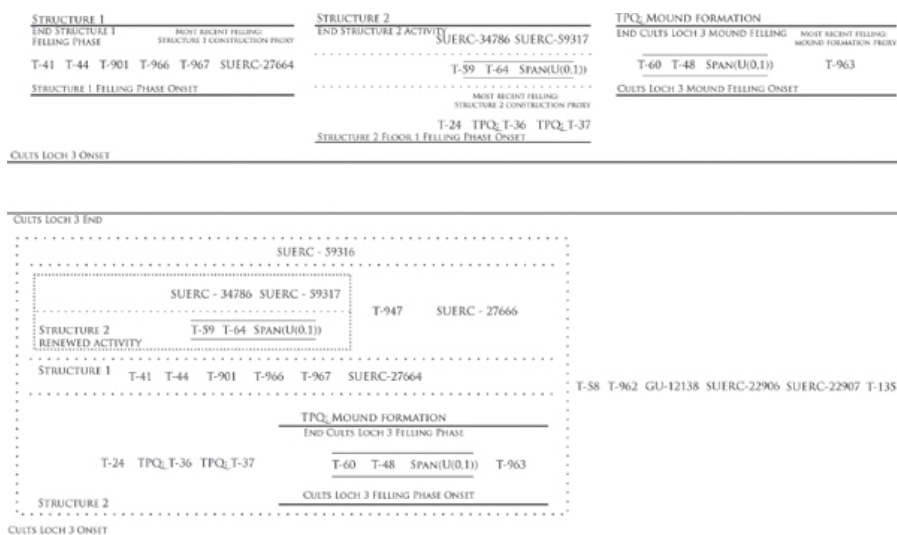
The model of the first step included information on the relationships within the structures, the data from dating the settlement mound timbers and an overall assumption that the three groups of data developed as a part of the same process ([Illus 61a](#)). Within ST1, sufficient dating evidence was available only from the sub-floor and the primary floor (timbers T41, T44, T901, T966 and T967 and the single radiocarbon determination, SUERC-27664). Within ST2, three timbers were sampled from the deposits relating to the original construction (T24, T36 and T37), the two stakes T59 and T64 from subsequent activity, and two determinations on short lived samples from context [602] (SUERC-34786, -59317). The mound was dated based on three timbers T963, T60 and T48, of which T963 comes from a deposit deep within the mound, T60 is a stake from underneath ST2 and T48 is a stake from underneath ST1. These were dated to ensure that any dates among the timbers from the two structures that were 'too early' could be identified as such. Indeed, the wiggle-match dates for T36 and T37 are earlier than the date for T60 and T48, and so are included in all the models as *tpqs* only, as they may have been recycled from some earlier building. Information on the relative alder chronological relationships is available for two pairs of timbers, T60 and T48 (ALSP1x10), as well as T59 and T64 (ALSP3x2), and implemented in the model.

The results of the first step of the analysis provide two plausible

scenarios of events (Table 9). The probabilities that ST1 timbers are older than T24 from the original floor of ST2 are all in the range 8–21%, making it very implausible that T24 was felled after the construction of ST1. However, the two stakes T59 and T64, from a refurbishment of ST2, are both younger than the ST1 timbers with probabilities of 64–80%, thus suggesting that they were felled sometime after ST1 was built. This would indicate that two scenarios are possible based on the radiocarbon information alone. In Scenario 1, Structure 2 was built first, abandoned for a period in which activity took place at Structure 1, after which time Structure 2 was re-built. Scenario 1, Structure 2 was built first, abandoned for a period in which activity took place at Structure 1, after which time Structure 2 was re-built. One possible explanation for this sequence could be that ST1 and ST2 formed a ‘figure-of-eight’ complex, although the probability of this being the case is slim given the technological constraints of timber roundhouses built on wetland mounds. In Scenario 2, all of the activity at ST2 took place after ST1 activity and all of the timbers dated from the floor of ST2 were re-used. Regardless of the scenario, the cessation of activity at ST2 happened after the building of ST1.

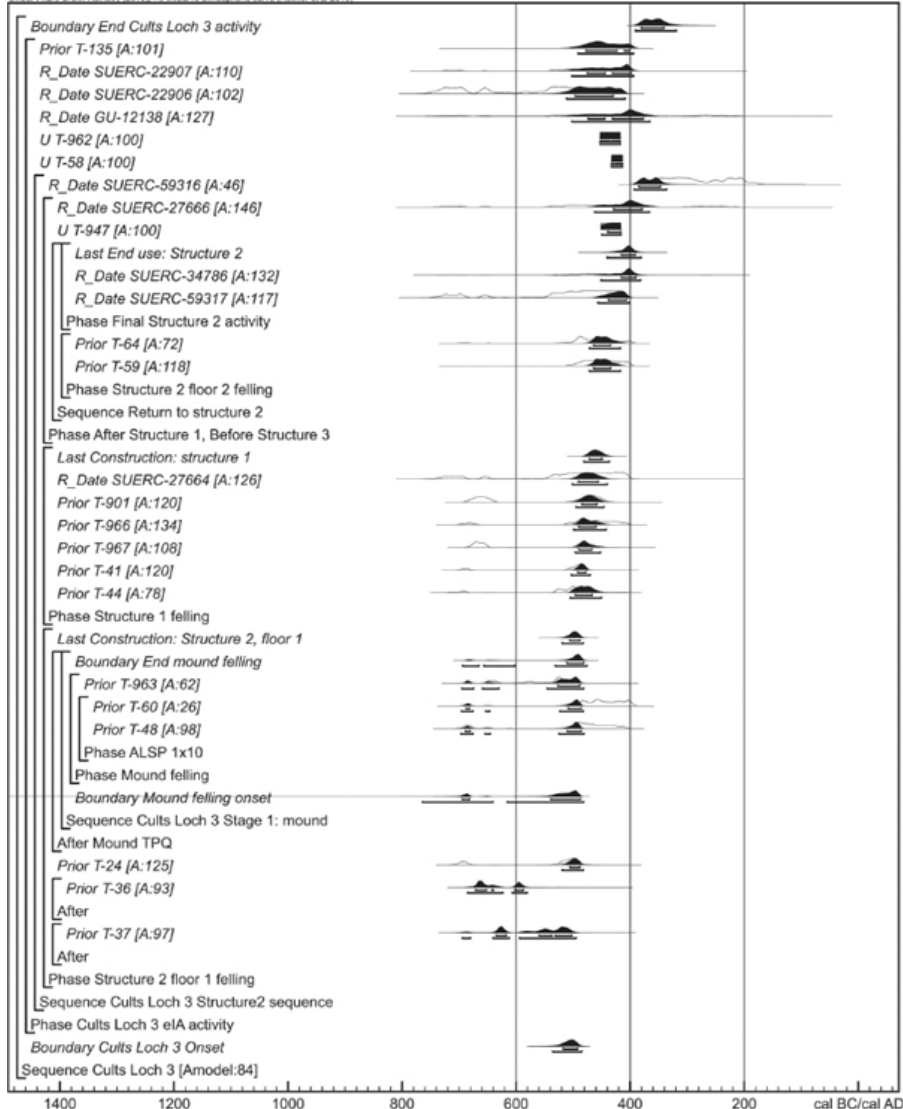
Table 9. The results of the model comparing the felling dates of Structure 1 timbers with timbers and charcoal from Structure 2. The percentages indicate the probability that a given Structure 2 timber (X-axis) is younger than a given Structure 1 timber (Y-axis)

Structure 2 > Structure 1 v	T24	T59	T64	[602]	SUERC- 59317
T44	20.55	77.14	77.14	80.95	81.07
T41	14.95	79.64	79.64	83.96	84.07
T967	8.70	69.09	69.07	74.43	74.55
T966	10.32	67.96	67.95	72.91	73.06
T901	8.14	63.75	63.75	69.11	69.24



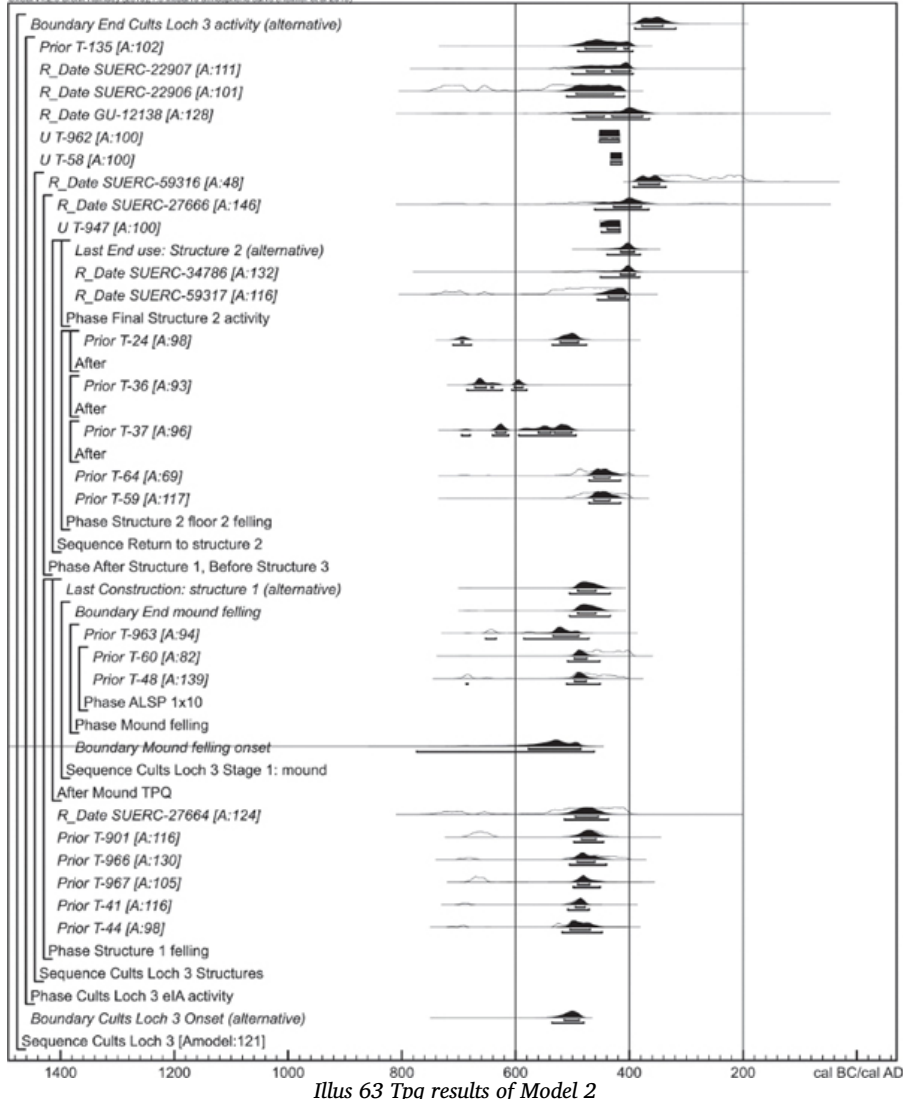
*Illus 61. a. Schematic representation of the model used to determine the probabilities of Structure 2 material succeeding Structure 1 material. The data for the crannog mound are included as tpqs.
b. Schematic representation of Model 1. Dendrochronological determinations are italicised
c. Schematic representation of Model 2. Dendrochronological determinations are italicised*

To evaluate which one of the two scenarios is more plausible, models describing each of them were built (*Illus 61b & 61c*). Besides the information already included in the model from the first step, all the other available chronological data were added, including the stratigraphic progression elsewhere on the site, individual radiocarbon dates and dendrochronological determinations. The two alternative models were then compared to evaluate if any one of them is more plausible than the other.



Illus 62 Results of Model 1

The results for Model 1, built on the assumption that Structure 1 was built during a hiatus in Structure 2 activity, are as follows (Model 1, built on the assumption that Structure 1 was built during a hiatus in Structure 2 activity, are as follows ([Illus 62](#));



Illus 63 Tpq results of Model 2

- The onset of activity in this sequence is estimated to 540–485 cal BC (95% probability; Cults Loch 3 Onset)
- The primary construction of ST2 is estimated to 520–480 cal BC (95% probability; Construction: Structure 2, floor 1)
- The construction of ST1 is estimated to 485–435 cal BC (95% probability; Construction: structure 1)
- The interval between the construction of ST2 and ST1 is 0–20 years (95% probability)
- The estimate for the end of the archaeological activity is 395–320 cal BC (95% probability; End Cults Loch 3 activity), but see the comment below
- The interval between the construction of ST1 and the felling date of

stakes T59 and T64 is of stakes T59 and T64 is 0–30 years (95% probability)

– The model agrees with the data ($A_{\text{model}} = 84$)

Although Model 1 also includes a parameter for the end of the activity represented by the remains of ST1, ST2 and ST3; SUERC-59316, the only determination from ST3, has low individual agreement with the model ($A = 46$). This might be the result of the imbalance in the distribution of the dating evidence, with the multiple dates and wigglematches on ST1 and ST2 exerting too great an influence on the only date from Structure 3. On account of this possibility, the end boundary parameter (*Illus 62 – End Cults Loch 3 activity*) ought to be treated with caution as it is probable that it is biased towards too early dates.

Model 2 was based on the assumption that ST1 was built first and that timber T24 from the original floor of ST2, which is older than all the ST1 timbers, is recycled. The results of this model are as follows (*Illus 63*);

- Onset of activity in this sequence is estimated to 540–480 cal BC (95% probability; *Cults Loch 3 Onset (alternative)*)
- The construction date for ST1 is 510–430 cal BC (95% probability; *Construction: Structure 2, floor 1 (alternative)*)
- The construction date of ST2 cannot be estimated as all of the timbers from its first floor are believed to be recycled
- The interval between the construction of ST1 and felling date of the stakes T59 and T64 is 0–30 years (95% probability)
- The estimate for the end of the archaeological activity in this sequence is 395–320 cal BC (95% probability; *End Cults Loch 3 activity (alternative)*), but, as was the case in Model 1, ought to be treated with caution, as it might be biased towards too early dates
- The model is in agreement with the data ($A_{\text{model}} = 121$).

Discussion

As both models agree with the data and produce posterior distributions that are for the most part plausible, it is impossible to make a clear-cut choice of one scenario over the other. On the one hand, Scenario 1, where ST2 was dismantled to make way for ST1 and then re-built, is difficult to conceive from a practical point of view. Having said that, the original floor of ST2 contains macroplant and insect evidence that suggests it might have been abandoned and flooded (floor (622/623) – see Chaps 2a & 2c. Furthermore, if

Scenario 2, in which ST1 was built first, is accepted, then all the structural activity between the construction of ST1 and the felling date of the stakes T59 and T64 had to take place within a period of 30 years at most (and in all probability much less; cf Suter & Schlichtherle 2009). Therefore, there is little on which to choose between the two models and they ought to be considered of equal plausibility given the available information..

Comment

Anne Crone & Graeme Cavers

The archaeological reasons for placing ST1 earlier than ST2 are given in [Chapter 2a](#) but are repeated in full here.

‘There is no visible stratigraphic relationship between ST1 and ST2 but it is argued that ST2 is later than ST1 because the floor plan of the former appears to truncate the latter. There is no surviving evidence for floor deposits to the east of H1, suggesting that they might have been truncated/removed by the construction of ST2.’

The argument is therefore based on absence of evidence and the relationship between the two structures remains ambivalent. Jacobsson’s recent modelling of all the dating evidence, including new determinations and wiggle-match dating, has now presented us with two scenarios which suggest a more complex chronological relationship between the two structures. There is archaeological evidence to support both scenarios; macroplant and insect evidence hints at abandonment and flooding of ST2, making Scenario 1 plausible, while there is evidence within ST2 of the reuse of timber, stake T106, horizontal T2 and within subfloor [624] for instance (see *Structural timber*), making Scenario 2 plausible. On balance, Scenario 2, in which ST1 is earlier and ST2 is built using re-cycled timbers is preferred because it does not require the complete removal of all evidence for an early phase of ST2.

Perhaps the most pertinent point to be drawn from the Bayesian modelling is that, whichever scenario is correct, the duration of time between the construction of ST1 and the insertion of stakes T59 and T64 in ST2 is between only *0–30 years (95% probability)* in both scenarios. Almost all the dendrochronological evidence (some of which is included in the modelling) also points to a similarly short duration of activity on the crannog so, whether ST1 is earlier than ST2 or *vice versa*, perhaps the more important outcome is the recognition that two houses were built, abandoned and replaced within one, at

most two, generations.

There is no archaeological evidence that the crannog continued in use beyond its short occupation in the late 5th century BC but in the early 2nd century BC the causeway was certainly renovated, as indicated by the dendro date of 193 BC for T972, an *in situ* stake in the causeway. The radiocarbon date from the ST3 deposit [206] (SUERC-59316; [Table 1](#)) now provides limited corroborative evidence for activity on the crannog at around this time. ST3 comprises a disparate group of features and deposits, some of which are very mixed; crucially ST3 has no obvious structural features and no clear central focus, unlike ST1 and ST2. It is therefore possible that late features have been included within this disparate group. The linear spread (214) and the stone cluster (204) lay just under the topsoil and were recognized as late in the sequence; the dated charcoal may have come from the mixed deposits of (203/206) around them and it now seems feasible that these relate to the early 2nd century BC re-use of the crannog.

Introduction

The sampling strategy on the crannog was to take bulk samples of all sediments encountered. Spatial sampling was not undertaken because of the difficulties encountered in defining the extents of most deposits, differential decay often blurring the boundaries. After processing a subsample of between 1 kg and 2 kg, the macroplant, charcoal, burnt bone and insect contents of selected contexts were analysed. Charcoal and insect remains were present in most samples but only those in which they were noted as frequent or abundant were selected for analysis. All burnt bone was examined but as it often occurred only as trace amounts of unidentifiable fragments it was often not possible to do more than quantify its presence.

Monolith and kubiena tin samples were also taken where sequences of sediments were exposed (Illus 21.1, 27.1 & 2, 32, 35.2 & 3, 41.1, 2 & 4) and these were used to address specific questions relating to the taphonomy of the deposits and the nature of the interfaces between deposits. Fourteen thin-sections were prepared (Illus 65–70) and in the text below they are referred to in the following way; M=monolith, K=kubiena followed by the year of excavation and the number of sample.

The specialist analyses have proved critical in aiding our understanding and interpretation of many of the deposits on the crannog. Consequently, in this chapter the specialist reports are not presented separately; instead, the separate strands of ecofactual evidence from each context are drawn together and then a synthesis of each context, or related group of contexts, is presented. Assemblage-based summaries are presented by the individual specialists at the end of the chapter, and their tabulated data and methodologies can be found in Appendices 1–3.

The ecofactual evidence is presented below in chronological order, the contexts appearing in the same order in which they are referred to in the Structural report. The interpretations presented in that section are influenced by the evidence presented in this section.

Phase 1; the crannog mound

Core 2009.2 charcoal-rich deposit ([Illus 35.2](#))

Macroplant: This core sample was particularly rich in terms of the species recovered and preservation was mostly good. The food remains were varied and included both cultivated and wild resources. The agricultural food remains were charred barley and cereal caryopses. The wild food resources were raspberry, blackberry, hazel and charred hazelnut shell. This sample also contained large quantities of bracken and leaves some of which were charred. There was a smaller number of wood chips and buds. The weed taxa included finds from waste ground and heath/moor land environments.

Charcoal: 0.8 g of charcoal was recovered from this sample. The species composition was as follows; hazel 54%, birch 23%, willow 15%, alder 7%. All but one of the identified fragments was small roundwood.

Core 2009.3 charcoal-rich deposit ([Illus 35.2](#))

Macroplant: Of all three cores this sample produced the smallest macroplant assemblage. The only plant material recovered was burnt wood chips, bracken and moss. There was also a small concentration of peat and decayed amorphous peat-like material.

Charcoal: 0.7 g of charcoal was recovered from this sample, some of which was roundwood. The species composition was as follows; alder 88%, hazel 12%.

Core 2009.4 charcoal-rich deposit ([Illus 35.2](#))

Macroplant: The macroplant assemblage from this core was small and consisted of wood chips, bracken, leafs and weeds taxa. There was no evidence of modern contamination in the form of roots in this sample.

Charcoal: 6.5 g of charcoal was recovered from this sample. The species composition was as follows; hazel 64%, willow 21%, alder 14%. Some of the hazel was roundwood.

Synthesis

These charcoal-rich deposits lie at the base of the foundation deposits, just above the natural peat over which the crannog was built ([Illus 35.2](#)). Their contents represent food and fuel debris and suggest that midden material was also included in the construction of the crannog mound. This implies the presence of a settlement nearby before the crannog was built.

Context (513) spread of carbonised wood

Macrophant: A large concentration of burnt peat along with a smaller quantity of charred grass caryopses was present. The assemblage also contained bark, wood fragments, weed taxa, amorphous organic material (see below for explanation) and roots, all waterlogged.

Charcoal: This context produced the largest assemblage of charcoal on the crannog; 84.8 g was recovered and the bulk of it was roundwood fragments. The assemblage consisted of 73% hazel and 27% willow. The rings of a proportion of each species were counted; the willow was between 6 and 9 years of age but the hazel displayed a greater range, of between 3 and 17 years. The bulk of the assemblage was under 15 mm in diameter but there was also a small proportion of roundwood some 20 mm in diameter. The willow was generally larger than the hazel although there was also some hazel which was 20 mm in diameter.

Insects: Occasional beetle sclerites in this deposit were charred, presumably representing individuals that had either been present among the wood when it was burnt or in the immediately surrounding substrate. Since the majority of the remains were not charred, the fauna recovered was presumed to relate largely to a period before and/or after the episode of burning. The uncharred sclerites were generally pale and eroded.

The composition of much of the insect assemblage suggested that this layer contained debris from human occupation. Decomposers dominated terrestrial insects (60%) and they included a fauna characteristic of relatively dry, mouldy vegetable litter within ancient buildings (Carrott & Kenward 2001; Hall & Kenward 1990; Kenward & Hall 1995). This group, consisting of *Cryptophagus scutellatus*, *Atomaria*, *Latridius minutus* group, and two other *Cryptophagus* species, accounted for 17% of the decomposers and 10% of the terrestrial assemblage. *Xylodromus concinnus* and *Crataeraea suturalis* are also frequently associated with a 'building fauna'. The bulk of the rest of the decomposer component consisted mainly of generalists found in decomposing plant debris, among which *Cercyon analis*, *Oxytelus sculptus* and *Carpelimus bilineatus* agg. were well-represented. *Carpelimus* species are adapted for burrowing into soft sediment on water margins and damp ground (Lott 2009, 61) but *C. bilineatus* agg. in particular appears to have exploited artificial habitats on ancient occupation sites. It is often found in large numbers in ancient house floor deposits (Kenward & Allison 1994; Kenward & Hall 1995). From the insect evidence alone it is difficult to determine whether the beetle assemblage represents *in situ* occupation or the dumping of

accumulations of occupation litter to contribute to the formation of the crannog mound. The location on the periphery of the crannog suggests that it may have been the latter. Scarabaeid dung beetles were relatively common, accounting for 14% of the decomposer group, and including at least eight *Aphodius contaminatus* which is associated with various types of herbivore dung (Jessop 1986, 23; Skidmore 1991, 149). Decomposer diversity as a whole was low (α RT = 11, SE = 2).

Grynobius planus and an *Anobium* species could have come from nearby trees or ivy, or may have been imported with timbers onto the crannog. *G. planus* is not usually regarded as a pest of timber buildings. The *Anobium* species did not look like a typical *A. punctatum*, the common woodworm beetle.

Insects from outdoor habitats (ie not usually found within buildings or in accumulations of decaying organic material) accounted for 21% of the terrestrial assemblage (27% if probable outdoor taxa are included). This is a somewhat higher proportion than in some of the other samples examined and may be a reflection of the more open conditions on the periphery of the crannog in comparison to deposits representing internal areas of structures. *Chaetarthria* and *Cercyon ustulatus* usually inhabit wet waterside mud (Friday 1988, 148) suggesting that there may have been muddy areas on the edges of the crannog. Other outdoor insects included the bug *Stygnocoris sabulosus*, a donaciine leaf beetle, *Agonum* cf *fuliginosum*, several *Phyllopertha horticola*, and *Notaris acridulus*, some of which may have arrived on the crannog with imported materials. *Trechoblemus micros*, a small ground beetle found in damp grasslands and various habitats close to water, often in association with small mammal burrows (Luff 2007, 69), is often suspected of being a post-depositional invader on archaeological sites. It has sometimes been found alive burrowing deeply in ancient deposits (Kenward & Allison 1994).

Aquatic forms accounted for 11% of the whole beetle and bug assemblage, the most numerous being *Oulimnius*, a riffle beetle (Elmidae) found under stones in welloxygenated running water or (less commonly) on stony lake shores (Holland 1972). Other aquatic invertebrates included statoblasts (the dormant overwintering stage) of the freshwater bryozoans *Cristatella mucedo* and ?*Plumatella*. Bryozoans occur as attached colonies on natural and artificial substrates in suitable water bodies.

Micromorphology: The sediment comprising context (513) is located in the centre of sample M09.2 (Illus 64). The coarse mineral fraction is composed mainly of poorly sorted fine to medium sand-sized

weathered quartz and feldspars, and common small sub-rounded sandstone fragments. The fine fraction is mixed; largely mineral, but with patches of fine charcoal and ash and areas of denser amorphous yellow organic material. A single coarse fragment (c.400µm) of fired clay-like material was identified in the centre of the unit.

The centre of the context is dominated by large (1000 µm–3 cm) cellular sub-angular charcoal with frequent smaller fragments (100–1000 µm) throughout the general matrix. Very few elongate and articulate phytoliths of probable grass origin are also present. The high proportion of charcoal within the centre of the sampled sediment indicates that this is the remnants of burning. Although there is no conclusive evidence that the wood was burnt *in situ*, irregular crumbs of apparently burnt organomineral and burnt peat are indicative of a burning event. Additionally the larger charcoal fragments are angular, which may indicate that they have not been eroded through physical movement. The survival of significant quantities of charcoal indicates that this was a relatively low temperature fire with reduced oxygen.

This context has been subject to significant postdepositional reworking as indicated by the granular crumb microstructure and frequent ellipsoid and mammillate excrements. Furthermore, the boundaries between the overlying and underlying contexts within this sample are diffuse, indicating that they have been exposed for sufficient time following deposition to allow for reworking by biological agencies.

M09_1B

CLUSTER OF
CHARCOAL
AGAINST LARGE
STONES

UNIT 2 (511)

MICROFABRIC 1

SHARP BOUNDARY

UNIT 1 [522]

CHARCOAL

M09_2

UNIT 3 [506]

DIFFUSE BOUNDARY

UNIT 2 [513]

DIFFUSE BOUNDARY

UNIT 1 [515]

Illus 64. Thin-sections M09.1b and M09.2

The composition of the charcoal in terms of species and size suggests that this deposit is the remains of a woven hurdle fence, the larger willow and hazel forming the stakes while the small hazel components were the horizontal withies. The micromorphological analysis suggests that the hurdle panel had burnt *in situ*, presumably resulting in the burnt grass and burnt peat seen in both the thin sections and macroplant assemblage. A characteristic group of decomposer beetles suggest that occupation debris, possibly old floor litter, was dumped on the periphery of the crannog, possibly outside the hurdle fence.

Phase 2; Structure 1

Context (520) mound of coarse gravel forming foundation layer of structure

Macroplant: The cereal remains recovered from this context were well preserved and consisted of waterlogged emmer spikelet forks, glume bases and rachis, as well as charred spelt, barley and cereal caryopses. Other food remains included hazelnut shell, some of which had been charred. Wood fragments, bracken and rush, as well as weed taxa were present. Burnt peat was also recovered.

Charcoal: 6.6 g of charcoal was recovered from this sample. The species composition was as follows; hazel 64%, oak 28%, alder 5% and birch 2%. Over half of the hazel was roundwood or twig fragments.

Synthesis

Hearth and cooking debris, as well as cereal processing waste, had become incorporated into the gravel. The mechanisms whereby this material became incorporated into the mineral deposits used on the crannog is considered later.

Context (634) homogeneous brown peat forming sub-floor deposit

Macroplant: This context was one of the richest on the crannog and preservation of the macroplant remains was good. Charred cereal caryopses and chaff were concentrated in this context and included emmer, spelt, bread/club wheat, barley, together with a smaller quantity of waterlogged emmer chaff. The large number of charred cereal remains within this deposit strongly indicates that food residues were frequently trampled into floor deposits within this area of the crannog. This was also the only sample on the crannog from which a bread/club wheat caryopsis was recovered. Other food remains

consisted of large quantities of waterlogged hazelnut shell.

Other waterlogged plant materials present included wood fragments, bark, moss, buds, bracken, sedges, rushes and grasses. Some of the buds and bracken fronds were charred. The four moss species present were all typical of woodland environments so they could have been accidentally imported onto the crannog attached to wood, but it is also possible that they were deliberately used as insulation.

The waterlogged weed taxa is unlikely to have been deliberately collected for use as a flooring/building material, nor is there evidence that any of these plants were used as a food source. Instead these plants could easily have been growing on or near to the crannog.

Charcoal: 8.5 g of charcoal was recovered from this sample. Alder and hazel roundwood was present.

Insects: Beetle and bug remains were well preserved by comparison with those in many of the other samples. Decomposers made up half of the terrestrial group and their diversity was low (α RT = 13, SE = 3). Ten per cent were typical of relatively dry mouldering plant material in settlements, and there were occasional indeterminate body segments of fleas (Siphonaptera). Decomposers associated with foul rotting material (*Cercyon unipunctatus*, *C. terminatus*, *Platystethus arenarius*, *Geotrupes* s.l. and *Aphodius*) were relatively well represented (17% of the decomposers, 9% of the terrestrial assemblage). The presence of at least the first three of these species may indicate that the deposit became rather wet which would have resulted in increased foulness – *C. unipunctatus* and *C. terminatus* are both characteristic of very foul matter. From the insects alone it could not be determined whether this deposit represented *in situ* occupation or initial waste dumping carried out to raise the level of the mound. Outdoor insects made up 22% of the terrestrial group (27% if probable outdoor insects are included). They included the chafer *Phyllopertha horticola*, *Chaetocnema arida* group found on grasses, sedges (*Carex*) and rushes (*Juncus*) (Cox 2007, 269), and the planthopper *Conomelus anceps* also found on rushes (Le Quesne 1960, 38). At least some of these might have arrived on the crannog in material such as turf or peat, or in cut ‘rushy’ vegetation used as floor litter.

Aquatic beetles and bugs made up 8% of the whole assemblage with *Oulimnius* the most numerous taxon. *Plumatella* statoblasts and fragments of larval caddis flies were common.

Synthesis

Much of the contents of the macroplant assemblage, ie bracken,

sedges, rushes and grasses is reminiscent of the better-preserved plant litter flooring found elsewhere on the crannog (ie see 521 = 608 = 633 below), and the insect assemblage attests to the presence of plant litter in various states of decomposition. This deposit must have built up between the logs of the floor during the occupation of the structure, food debris and weed taxa becoming incorporated through trampling. There is no burnt peat and only a small amount of charcoal suggesting that the occupants were more careful with the disposal of their fuel debris.

Context (607) Upper gravel fill of H1

Macroplant: The preservation of the macroplant remains in this context was poor. The only plant remains recovered were a small quantity of waterlogged fat hen, rush and *sphagnum*. Amorphous organic material was present, as was a large concentration of what appeared to be intrusive roots. This context appears to have undergone periods of aeration which may have undermined the preservation of archaeological organic material within this feature.

Synthesis

This deposit was high up in stratigraphy which would account for the complete decay of the waterlogged macroplant component but the absence of a carbonised component, which would have survived dessication, suggests that the hearth framework had been filled with relatively clean gravel to provide a new foundation.

Context (612) hearth debris abutting H1

Macroplant: The macroplant remains from this context was small and poorly preserved. Waterlogged fat hen seeds, bark and decayed wood fragments were present. The food remains consisted of a small number of charred spelt chaff and cereal caryopses.

Charcoal: 0.6 g of charcoal was recovered from this sample. Hazel and oak was present.

Synthesis

The presence of charred food remains and charcoal suggest that the interpretation of this deposit is correct.

Context (521) = (608) = (633) plant litter layers

Macroplant: The macroplant remains from this context were well preserved. The assemblage was dominated by flooring materials which

included waterlogged wood fragments, bracken stems and pinnule fragments, rush seeds, buds, rush, sedge, grass and leaves, one of which was identified as holly. The only charred remains were a small number of partially burnt wood fragments and pale persicaria fruits which is a common weed plant. The charring of the pale persicaria appears accidental rather than deliberate as this plant is unlikely to have been used as either a fuel or food source on this site. No food remains were recovered and the rest of the plant assemblage was made up of waterlogged weed taxa which are representative of waste ground and damp habitats. The only weed taxon with any real economic importance was selfheal. This plant has traditionally been used as a medicine (Miller 2002, 41 – and see below), but it was recovered in such small quantities that an interpretation of its economic role and importance if any is unclear.

A well preserved puffball ([Illus 70](#)) was recovered from this context. Puffballs commonly grow in woodland, on the ground or on decaying wood. It could have been collected accidentally along with wood but the size of this example would have made it difficult to overlook and its intact state and good preservation suggests that it might have been deliberately collected for food.

This context was particularly rich in moss remains with the leaves and shoot fragments of four species identified. It is probable that some species recovered from the crannog were collected deliberately for their uses as bedding, insulating material, packing, bandages and for toilet paper. However, given the dominance of floor coverings and the absence of other forms of debris, it seems more likely that these mosses were by-products of wood-gathering.

Context (608) = (521) = (633) plant litter layers

Macroplant: No macroplant analysis of this context was undertaken but on-site observations recorded the presence of rushes and bracken, charcoal and hazelnut shells.

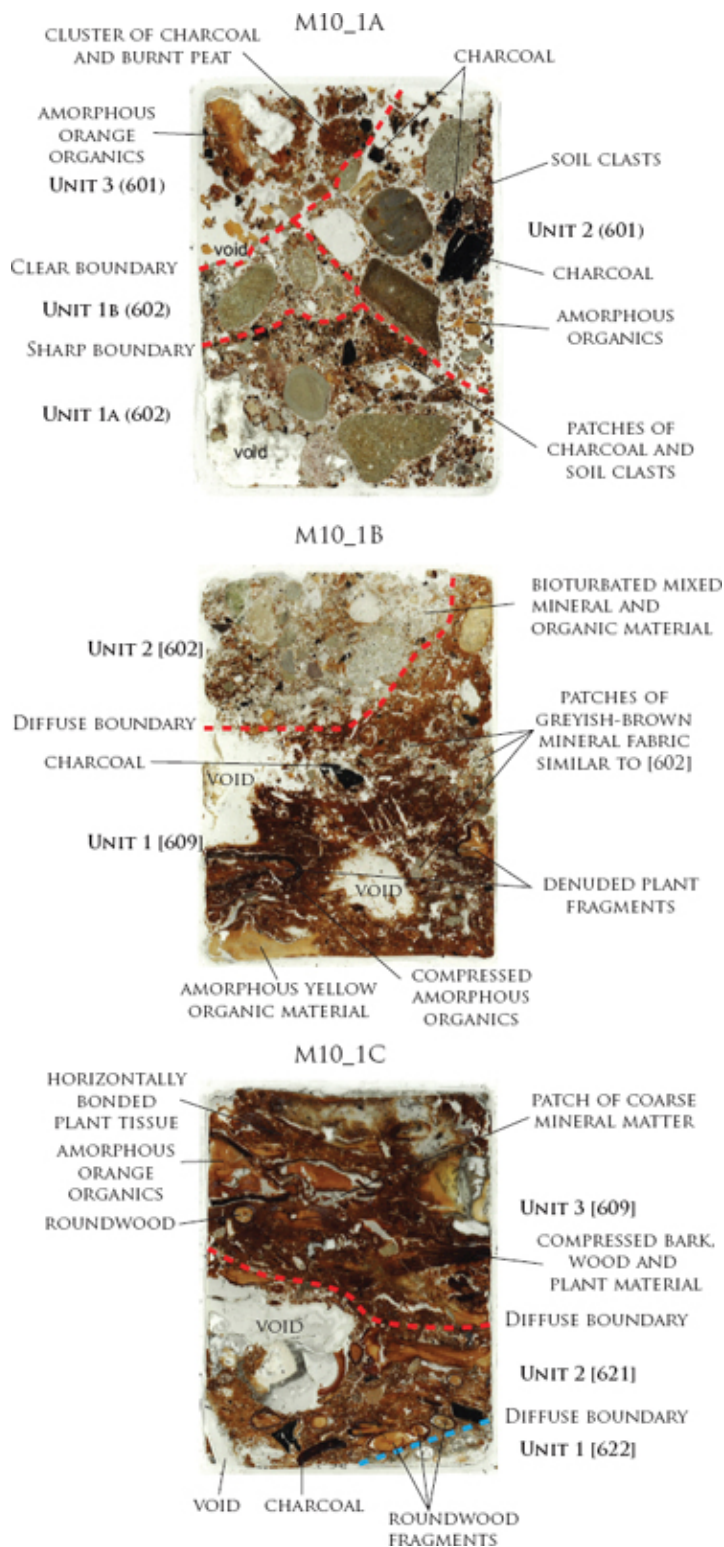
Burnt bone: This context produced 22 burnt fragments. These included vertebrae and long bone fragments.

Context (633) = (521) = (608) plant litter layers

Macroplant: The preservation of the plant material from this context was good and large concentrations of waterlogged bark, wood fragments, bracken, rushes and four species of mosses were recovered. The mosses were probably the by-products of wood-gathering. The food remains consisted of a small number of charred cereal caryopses and hazelnut shell some of which were also waterlogged. The

waterlogged weed taxa, knotweed, goosefoot, orache, chickweed, nettle and thistle are all characteristic of disturbed and damp ground.

Insects: Decomposer beetles accounted for 63% of terrestrial insects with *Cercyon analis* and *Carpelimus bilineatus* agg. the most common taxa. Diversity of the group was low (α RT = 12, SE = 2). Beetles associated with dry mouldering vegetable matter made up 7% of the decomposers and included the bug *Lyctocoris campestris*. Another 7% were associated with foul matter (*Cercyon unipunctatus*, *C. terminatus*, *Geotrupes* s.l. and *Aphodius contaminatus*). Fly puparia were noted in the context description, and the most obvious were of house flies, providing an indication of the foulness of parts of the deposit. *Salpingus planirostris* usually occurs under tree bark and may have arrived with wood used in the floor surface. Outdoor taxa accounted for 12% of terrestrial insects and they included *Phyllopertha horticola*, *Stygnocoris sabulosus*, *Chaetocnema arida* group, and *Conomelus anceps*, at least some of which could have arrived in material such as turf or peat and cut 'rushy' vegetation used as floor litter. *Dryops* provided an indication of the presence of wet waterside mud. Statoblasts of ? *Plumatella* and caddis fly larval fragments were common and aquatic beetles and bugs accounted for 6% of the whole assemblage.



Illus 65. Thin-sections M10.1a, M10.1b & M10.1c

Synthesis of (608) = (521) = (633)

When found these deposits were all strongly laminar and identifiable fragments of plants could be seen. The macroplant analysis has confirmed the composition of these plant litter floor coverings while the insect assemblage indicates the foul condition that at least parts of the floor coverings had descended into. This may have been very localised because what is most remarkable is the overall cleanliness of the floor coverings. There were no food remains in (521), except possibly the puffball, while only small amounts of burnt bone, charcoal and hazelnut shell were found in (608) and a small quantity of charred cereal remains were found in (633). These may represent small, discrete areas of debris, accidentally dropped.

Context (522) hearth rake-out

Macroplant: This context was particularly rich in waterlogged bark, wood fragments and rush seeds along with a smaller quantity of sedge nutlets, leaves and buds. The only food remains were waterlogged hazelnut shell. The rest of the assemblage consisted of waterlogged weed taxa such as nettle, dock and goosefoot. Small fragments of burnt peat were present and some of the wood fragments were also burnt. A poorly preserved fragment of waterlogged puffball was also found in this context (see (521) above for comment).

Charcoal: 64.1 g of charcoal was recovered from this sample. The species composition was as follows; hazel 66%, oak 31%, willow 2%. Some 78% of the hazel consisted of roundwood fragments.

Burnt bone: This context produced 54 burnt bone fragments. These included a rib and two poorly preserved teeth fragments. The majority of the fragments were completely calcified but four fragments were only partly calcified which indicated they had been burnt at either a lower temperature or for a shorter period of time.

Micromorphology: (522) is seen in the lower part of sample M09.1B (Illus 64). The coarse mineral component accounts for approximately 30% of the unit and comprises dominant quartz with few feldspars. A single large (c 4 cm) rounded lithic greywacke fragment occupies the base of the sample. The remainder of the coarse fraction is dominated by burnt material including ash, charcoal of all sizes, charred/reddened plant material, fragmentary biogenic silica as well as unburnt plant fragments. The plant material has a strongly expressed parallel arrangement and appears to comprise fragments of herbaceous and woody tissues in varying states of decomposition (slightly to very strongly decomposed, following Fitzpatrick 1993). The remaining coarse material is randomly oriented and aligned but

frequently clustered in patches. The matrix is yellowish to reddish brown probably due to the presence of charred amorphous organic matter with fragmentary biogenic silica (ash). There are common clasts of probable grass ash dominated by phytoliths and anorthic burnt peat fragments.

The dominance of phytoliths and apparent absence of spherulites in (522) is indicative that the fuel used at Cults Loch 3 was derived from vegetation not dung. The frequent occurrence of burnt peat and charcoal found throughout the samples indicates that the main fuel used was derived from peat and wood and as such it is probable that the grass ash within (522) is the remnant of burnt organic flooring/matting. Combustion with limited oxygen led to the survival of organic residues in a carbonised form as evidenced by the carbonised peat fragments. The presence of unburnt plant material rules against burning *in situ* while the presence of part charred reddish orange plant tissue and frequent charcoal rules against burning to a high temperature making it likely that the material within (522) represents waste from a domestic hearth. The banded nature of the deposit and parallel orientation of plant fragments suggest against a single dump of hearth material. Rather it would seem probable that (522) represents the deliberate collection and deposition of burnt waste material, ie regular hearth clear out. The apparent random clustering of coarse minerals and charcoal could be accounted for by the process of raking/spreading of hearth debris causing an uneven distribution of material. Regular deposition/raking of hearth debris would also account for the inclusion of unburnt waste including unburnt peat fragments and unburnt roundwood fragments.

The boundary between (522) and (511) is sharp and the dipping nature of the minerals is consistent with the interpretation that (511) was dumped onto the surface of (522). The paucity of observed pedoturbation pedofeatures is also indicative that (522) accumulated relatively rapidly and was not left exposed to biological or physical weathering for any length of time prior to the dumping of (511).

Synthesis

The contents of this deposit confirm the interpretation that it represents numerous episodes of hearth debris. The quantities of charcoal present indicate that wood was the primary fuel type but peat was also used. The only food waste burnt in the fire were bones but it is clear from the micromorphological analysis that old floor coverings had been thrown onto the hearth, some of which were only partially burnt when the hearth was cleared out. This interpretation is

supported by the quantities of rush seeds and sedge nutlets present in the macroplant assemblage. It may also explain the presence of large quantities of unburnt bark in the deposit.

Context (511) coarse gravel deposit

Macroplant: Charred food remains included barley rachis, wheat and cereal caryopses, and waterlogged emmer spikelet forks and hazelnut shell were also present. Other plant remains included a small amount of knotweeds, goosefoot and rushes. Burnt peat was also present.

Charcoal: 7.6 g of charcoal was recovered from this sample. The species composition was as follows; hazel 52%, oak 20%, alder 12%, birch 4% and willow 4%. Some 38% of the hazel consisted of roundwood fragments.

Burnt bone: This context produced 49 burnt fragments. These included a long bone and skull fragment. The bone was mostly smaller than 10 mm and had been exposed to different temperatures.

Micromorphology: (511) is located at the top of sample M09.1B ([Illus 64](#)) and is a coarse moderately sorted sand deposit. Impregnation problems have created large voids throughout the sample but the coarse mineral fragment accounts for almost 60% of the remaining sediment. The coarse mineral component is dominated by quartz with frequent sub-rounded sandstone fragments and frequent burnt and unburnt bone fragments. The coarse organic component comprises frequent large charcoal (1000 μm –1 cm) charcoal and common smaller (100–1000 μm) fragments, few parenchymatic and lignified plant tissue fragments as well as few wood fragments and few burnt peat. The burnt material (mainly charcoal and bone) is concentrated in the centre of the slide and has a patchy apparently random distribution with some clustering of charcoal against large stones. Phytoliths are common throughout the unit and there is a patch of dominant phytoliths in the centre right of unit few of which are articulated. The fine fraction is mixed, consisting of mineral and organo-mineral material ranging from light to dark yellowish brown to grey.

As discussed above, the boundary between (522) and (511) is sharp, and the dipping nature of the minerals and the appearance of the fine fraction of the groundmass are consistent with a dumped deposit. The sub-rounded nature of the minerals and rock fragments alongside their moderate sorting may indicate that they have been re-deposited from an alluvial or lacustrine environment raising the possibility that they were intentionally imported from the surrounding loch shore to raise the floor layer. The frequent inclusion of anthropic indicators such as

charcoal, bone and burnt peat is indicative that the unit has been mixed with occupation debris either pre- or post-deposition. The distribution of anthropic inclusions appears to cluster in voids around large fragments. This is indicative of slipping and may have been caused by postdepositional mixing possibly by compression or flooding. Other textural pedofeatures consistent with physical movement and disturbance are also present, with fine silt material partially lining several larger voids and dusty clay infills to few voids again indicating that this sediment may have been subject to post-depositional alteration.

Synthesis

Hearth debris, cooking and food processing waste have become incorporated into this gravel which was subsequently used to re-level the surface.

Phase 3; Structure 2

Context (622) plant litter layers

Macroplant: The dominant component of this context was herbaceous stems, rush seeds, bracken, wood fragments and moss which had been compressed into distinct layers. The mosses were probably accidentally introduced to this deposit as a by-product of wood-gathering. The remainder of the assemblage was dominated by waterlogged weed taxa. The quantity of weeds was large and was a mixture of nettles, knotweeds, goosefoot and chickweed, all characteristic of waste ground. The only food remains were waterlogged hazelnut shell.

Insects: Insect remains were common and relatively well preserved, but sparsely distributed relative to the amount of plant material in the flot. Decomposers accounted for well over half of the terrestrial assemblage with *Cercyon analis* the most numerous species. Diversity of this element was somewhat higher than in most other assemblages examined (α RT = 16, SE = 4). Beetles associated with relatively dry vegetable litter in buildings accounted for 14% of the decomposers. Foul decomposers (*Cercyon terminatus*, *Geotrupes* s.l. and several *Aphodius* species, including *A. contaminatus*) accounted for another 13% of the group. A bark beetle (*Dryocoetes*) is likely to have been collected with twigs used in the floor covering. Several ground beetles were identified: *Pterostichus diligens* and *Agonum* cf *fuliginosum* from damp habitats, *Pterostichus strenuus*, found in a variety of habitats

especially grasslands, and *Trechus obtusus* or *quadristriatus*.

Aquatics were more common in this deposit than in any of the others sampled for insects (18% of the whole assemblage), represented largely by several *Oulimnius* and the fragmentary remains of an estimated ten adult water boatmen (Corixidae) and occasional nymphs. *Hydraena testacea* found in stagnant, often muddy water was also recorded, and statoblasts of ?*Plumatella* and caddis larval fragments were common. The higher proportion of aquatic beetles and bugs may be suggestive of more aquatic conditions than in other deposits, resulting either from inundation of the mound or perhaps the use of dredgedup waterlain sediment for raising or consolidation. The evidence was equivocal however, since water beetles were no better represented than in other deposits, the proportion being mainly elevated by the larger numbers of water boatmen. The latter are very capable fliers and would have been a common element in the lochside aerial insect fauna, although their nymphs are obligate aquatics. The proportion of aquatics was considerably lower than in some deposits at Buiston Crannog where they accounted for 36–53% of the assemblages and provided convincing evidence for aquatic deposition or the use of dredged sediment (Kenward *et al* 2000).

Synthesis

The composition of this floor covering included bracken, rushes and herbaceous stems, possibly grasses or sedges, and like that of other examples on the crannog the floor coverings are remarkably free of hearth debris and food processing waste; only hazelnut shell was found. The insect assemblage reflects both dry and foul conditions within the building. There are hints in the combined evidence from the insect and macroplant assemblages that the building may have been abandoned for some time after this floor was laid down and before the deposition of the gravel deposit (621) which sealed it. Flooding could explain the relative abundance of aquatic species and if the building was abandoned as a consequence this would explain the presence of the large quantities of weed seeds in the floor deposit; some of the knotweeds present grow in muddy /wet damp environments and can also survive periodic flooding.

Context (609) plant litter layers

Macroplant: The macroplant assemblage from this context is dominated by a large quantity of well preserved waterlogged bark, wood fragments, buds and weed taxa. No charred macroplant remains were present in this deposit. Herbaceous stems, rush seeds and grass

caryopses were compressed into distinct layers. The weed assemblage consisted of a mixture of knotweeds, goosefoot, orache, chickweed and plantain, taxa which are characteristic of disturbed waste ground. Goosefoot and chickweed are also typical contaminants of cereal crops, but as no food residues were present in this deposit this is probably an unlikely source for their presence. Plantain has been used as a medicine but given the small number of seeds recovered and the absence of any other economically useful plants in this deposit it is more plausible that these remains are intrusive.

Micromorphology: (609) is represented in sample M10.1B and M10.1C (Illus 66). In both samples this context is a compact banded organic deposit with organic material comprising c 85% of the unit in M10.1C and c 80% of M10.1B. The coarse mineral component is dominated by quartz in both samples with few feldspar. The coarse mineral component is poorly sorted but unevenly distributed in patches and bands. M10.1B contains patches of microfabric which is composed of c 60% coarse mineral (dominated by quartz) with frequent phytoliths and ash. The coarse organic component of both samples is dominated by horizontally banded parenchymatic tissue at varied stages of decomposition. The plant material is associated with patches of dominant phytoliths and frequent partially decomposed/compressed wood and bark fragments. Anthropoc indicators are present in the form of common charcoal, ash patches and burnt peat fragments commonly associated with the coarse mineral fraction.

The banding and laminations within (609) are indicative that this deposit built up gradually on top of the underlying (621). Much of the bark and wood material within (609) has a curled appearance indicating that it has been compressed and lost its structure (Schweingruber 1982, 202). The compression of the wood material may have been as result of trampling and/or exposure to wet– dry cycles. Compaction of (609) is further indicated by a low porosity of 2–5% and partially infilled polyconcave voids.

The boundary between (609) and (602) in M10.1B is relatively diffuse and some mixing with (602) appears to have occurred indicating that this layer has not been deliberately truncated or cleaned as appears to be the case with other floor layer samples. It is more likely that the surface of (609) was left exposed for a period of time before (602) was dumped onto it (see below).

Synthesis

The micromorphological and macroplant evidence supports the interpretation of this deposit as a series of compacted floor surfaces

periodically covered with fresh plant material which has been trampled and compacted into the unit alongside heterogeneous mixed mineral material before each successive layer of plant material has been added. Again, the absence of hearth or food debris within the plant litter is noticeable; microscopic amounts of hearth debris, ie charcoal, ash and burnt peat were observed in the thin-sections but only in association with the mineral component. It is possible that the floors were periodically cleaned and sand scattered over them before a new layer of plant litter was laid down. The presence of large quantities of weed seeds cannot be explained as trample because there is little other evidence of trampled-in debris so it is possible that weeds colonised the floor during a period of abandonment. The micromorphological evidence suggests that (609) was left exposed for some time, allowing enough time for mixing by plants and animals, and again this suggests a period of abandonment.

Context (602) gravel deposit

Macroplant: Macroplant preservation was mostly poor and the finds were limited to waterlogged wood chips, hazelnut shell, fat hen, amorphous organic material, peat and burnt peat.

Charcoal: 0.6 g of charcoal was recovered from this sample. Alder and hazel were present in equal proportions.

Burnt bone: This context produced 90 burnt fragments which were among the better preserved fragments on the crannog. Long bone, rib, skull, vertebrae, and a sheep phalange were identified. Most of this material had also been exposed to varying temperatures and was not completely calcified.

K10_1



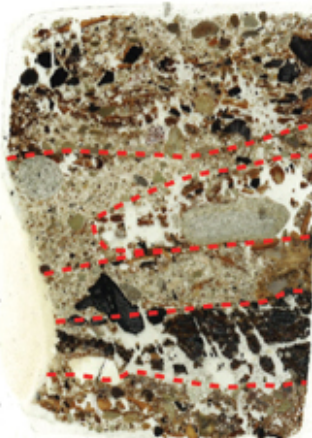
UNIT 2 (616)

CLEAR BOUNDARY

UNIT 1 (620)

CHARCOAL

K10_3



UNIT 6 (620)

DIFFUSE BOUNDARY

UNIT 4 (636)

UNIT 5 (636)

CLEAR BOUNDARY

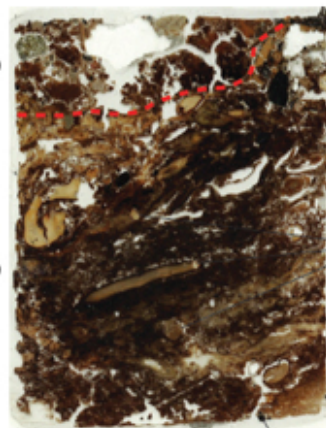
UNIT 3 (636)

UNIT 2 (636)

CLEAR BOUNDARY

UNIT 1 (636)

K10_4



UNIT 2 (620)

UNIT 1 (643)

BONDED HUMIFIED
PLANT REMAINS

CHARCOAL

Micromorphology: (602) is located in samples M10.1A and M10.1B (*Illus 66*). It is a poorly sorted silty sand with a moderately developed sub-angular blocky microstructure. The coarse mineral component is more varied in mineral composition than noted in any of the other contexts analysed for micromorphology and comprises common sub-rounded to sub-angular sandstone rock fragments as well as dominant quartz, few plagioclase feldspar, very few biotite, very few chlorite, very few muscovite and very few hornblende. The coarse material as seen in M10.1A appears random in distribution and orientation but in M10.1B appears banded and dips at an angle of 45° (moderately expressed). The coarse organic component comprises few orange parenchymatic plant tissue, few organic residues and common (100–10,000 µm) charcoal. The fine material is dominated by reddish brown amorphous organics.

(602) as represented in M10.1A contains the remnants of ash as expressed in the colour of the matrix, patches of ash associated with few phytoliths, common charcoal fragments, common burnt peat fragments and a single large fragment of unburnt bone in the bottom of the slide. (602) as represented in M10.1A is significantly coarser with fewer organic inclusions and amorphous organic matter towards the top of the unit and very few charcoal. The incorporation of grey unoriented clay within the groundmass may have been washed into the profile and is indicative of post-depositional flooding.

(602) is interpreted as redeposited gravel which has seen the incorporation of silt, dusty clay, organic matter and general occupation debris through physical mixing which has concentrated the organic material at the base of the unit. The dipping nature of the minerals and rock fragments as seen in M10.1B and 45° boundary with the overlying (601) are consistent with a dumped deposit. Post-depositional reworking of the deposit is evidenced by the presence of excremental fabrics and relative well mixed nature. The sub-angular blocky structure of this context may be indicative that it underwent periodic wetting and drying (Fitzpatrick 1993).

Synthesis

Hearth debris and cooking waste, represented by the most substantial assemblage of burnt bone found on the crannog, had been incorporated into this deposit before it was dumped.

Context (604) organic floor surface

Macrophant: This context was composed primarily of amorphous organic material. The food remains from this context consisted of a small number of waterlogged raspberry seeds and charred barley caryopses and rachis. The waterlogged assemblage contained wood fragments (some of which were partially burnt), small quantities of rush seeds, nettle and orache, as well as large quantities of fat hen and goosefoot. Fat hen is known to have been consumed as a foodstuff (Renfrew 1973, 170; Robinson 1987; Bishop *et al* 2007, 80) but this assemblage is not charred, as one might expect of food debris, nor was there more than trace evidence of food debris in the deposit, so its abundance here is more probably due to its presence as a weed on the crannog. Burnt peat and peat fragments, probably representing hearth waste, were also present.

Insects: Decomposers accounted for 64% of the terrestrial beetle and bug assemblage and the group was very similar to those recorded from other samples from floor litter. *Gyrophypnus fracticornis* and *Carpelimus bilineatus* agg. were particularly common. Decomposer diversity was similar to many of the other samples (α RT = 10, SE = 2). Taxa typical of a building fauna included *Latridius minutus* group, *Cryptophagus scutellatus*, *Atomaria*, *Xylodromus concinnus* and a human flea (*Pulex irritans*). Foul matter beetles *Cercyon unipunctatus*, *Geotrupes* s.l., and three species of *Aphodius*, including *A. contaminatus*, accounted for 8% of the decomposers. Insects from outdoor habitats included the ground beetle *Pterostichus diligens*, *Conomelus anceps* found on rushes, and *Dascillus cervinus*. The last species has turf-living larvae and is typical of short-turfed grassland. Aquatics accounted for 6% of the whole assemblage and included *Hydraena testacea* and the riffle beetle *Oulimnius*. Statoblasts of *Cristatella mucedo* and ?*Plumatella* were common.

Synthesis

Although this deposit was very different in appearance to the other plant litter floor coverings the insect assemblage is very similar. It is possible that decomposition was further advanced in (604) as suggested by the primary matrix of amorphous organic material. It also differs from the other floor coverings in that it was a little less clean, and contained small amounts of hearth debris, in the form of burnt peat and burnt wood chips, and food debris. The weed seeds might have been trampled in with this material but it is also possible that the large quantities of fat hen and goosefoot are present in the deposit because they colonised the building after abandonment.

Context (635) plant litter layers

Macrophant: A bulk sample and kubiena sample from this context were examined. The major component in both samples was waterlogged bracken stems/pinnule fragments, wood fragments, leaf litter, herbaceous stems, rush seeds and capsules, compressed into distinct layers. There was a large quantity of amorphous organic material. The waterlogged weed assemblage was small and comprised knotweeds, goosefoot, plantain and selfheal. The plantain and selfheal do have secondary uses as medicinal plants and the recovery of both these species from the same context is perhaps suggestive. The remaining weed taxa are all characteristic of wet damp habitats and waste ground. No food remains were recovered from this deposit.

Insects: Preservation of insect remains was good by the standards of the site and fragmentation and erosion were relatively low. Half of the beetle and bug assemblage consisted of decomposers, among which *Cercyon analis*, *Gyrohyphus fracticornis* and *Leptacinus pusillus* were most numerous. Diversity of the group was rather higher than in most other samples (α RT = 16, SE = 3). Beetles associated with dry mouldering vegetable material in buildings were particularly well represented, making up a quarter of the decomposers and 13% of terrestrial insects. They included *Latridius minutus* group, several *Atomaria*, *Cryptophagus scutellatus*, other *Cryptophagus* species and the bug *Lyctocoris campestris*. Of particular interest were remains of a number of insect ectoparasites: two species of biting lice (Mallophaga: Trichodectidae) and human flea. The biting lice were *Bovicola caprae* and *B. ovis* found on goats and sheep respectively (formerly referred to the genus *Damalinia*). These are discussed further below. Foul matter was represented by single individuals of three *Aphodius* species and *Geotrupes* s.l..

Some beetles were probably imported onto the site with wood: *Sinodendron cylindricum* burrows in dead wood of various deciduous trees and Ciidae species are associated with tree fungi. Outdoor taxa made up 14% of terrestrial insects (19% if probable outdoor insects are included). Most were associated with various plants, and could have been brought onto the crannog with imported materials, although some may have arrived as 'background' fauna. The planthoppers *Conomelus anceps* and *Oncopsis* are respectively found on rushes and various trees and shrubs. *Chaetocnema concinna* is usually associated with knotweeds (*Polygonum*) (Bullock 1992) and donaciine leaf beetles are found on waterside or emergent vegetation. Nymphs of a jumping plant louse *Strophingia ericae* and the weevil *Micrelus ericae* are specifically associated with heathers (*Calluna* and *Erica*) and are

almost certainly from heathland turf or peat used either as fuel or structurally. Aquatic invertebrates were represented by a single water boatman (Corixidae), and ?*Plumatella* statoblasts.

Synthesis

The composition of this floor covering is identical to others on the crannog and is also remarkably clean, with no evidence of hearth debris or food processing waste. The insect assemblage is also typical of plant litter mouldering within buildings. This floor covering contains a much smaller weed assemblage than other floors within ST2; if the weeds arrived through colonisation after abandonment, then perhaps this part of ST2 was too far removed from the entrance to be colonised. The biting lice were not sufficiently numerous to suggest that goats and sheep were kept in this part of ST2, but they may have been brought onto the crannog in untreated skins or fleeces.

Context (606) gravel deposit

Macroplant: The macroplant assemblage from this context consists of both waterlogged and charred food remains and weed taxa. Cereal remains include charred emmer spikelet forks and wheat caryopses. This context also contained one of the largest quantities of both waterlogged and charred hazelnut shell found on the crannog. While the hazelnuts would have been collected as a foodstuff the nutshells may have been used as kindling (Jones 2000, 80; Bishop *et al* 2007, 79; Jones & Rowley-Conwy 2007, 400). Small quantities of waterlogged wood fragments, bark, bracken and rush were recovered along side charred bracken and burnt peat. The waterlogged weed taxa are all representative of disturbed and damp environments. The food remains and other finds recovered from this context are representative of domestic waste probably originating from the cleaning-out of hearth deposits.

Burnt bone: This context produced 57 fragments of which 16 were unburnt. Several of these fragments were not as poorly preserved as the rest of the assemblage and it was possible to identify long bone, rib and skull fragments. Most of the fragments had been exposed to lower temperatures and were not completely charred.

Synthesis

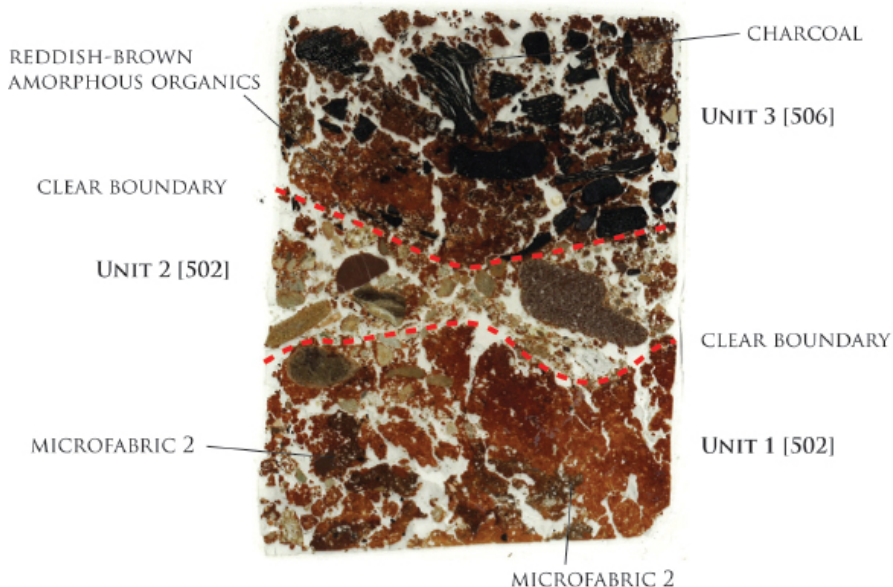
As with the other gravel deposits, (606) is rich in hearth debris and food processing waste. The presence of charred and waterlogged bracken, as well as waterlogged rush seeds suggests that floor coverings were being burnt on the hearths. Whether this material

became incorporated into the deposit through trampling or whether it had been deliberately mixed in with the mineral soil, as the micromorphological evidence from (602) suggests, is not known.

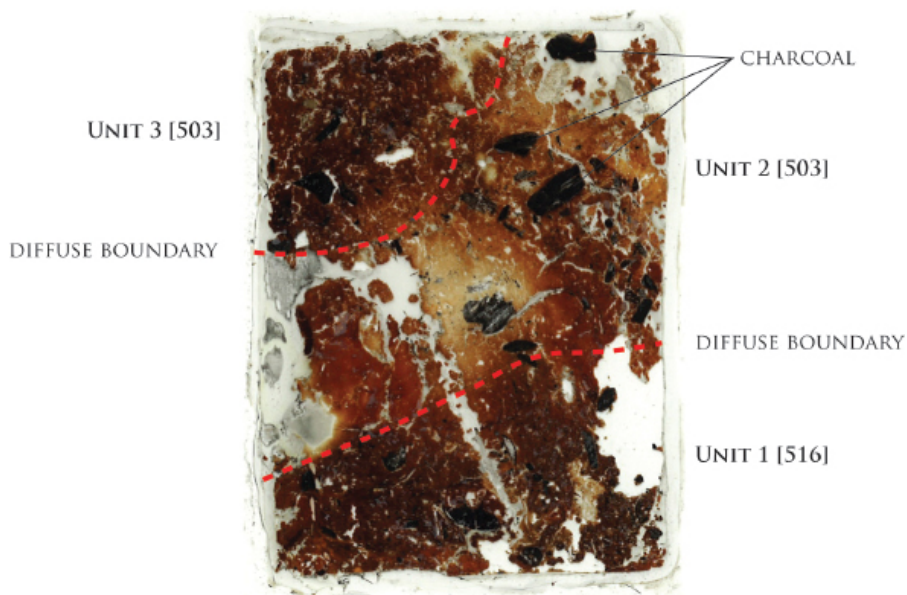
Context (643) organic lens interleaved with gravel abutting H2

Micromorphology: (643) is located at the base of sample K10.4 ([Illus 67](#)) and appears as a thin lens of sediment sandwiched between layers of gravel in section drawings ([Illus 27.1](#)). (643) comprises a platy (lenticular) compressed organic (c90%) deposit consisting of horizontally banded well humified plant remains similar to those seen in (102), (212), and (616). Anthropoc markers are rare and limited to fragmentary charcoal at the base of the unit and fine charcoal within void spaces which may have been washed/ trampled in from other layers. Surviving evidence for horizontal banding in the tissue fragments indicate that they were deposited in a fresh condition and decomposed *in situ* and the wavy appearance of the wood fragments is indicative of advanced decomposition and compaction. The banding observed in (643) in the field and in thin section is thus an artefact of varying levels of decomposition and does not represent artificial surfaces within each lens.

K09_2



K09_3



Illus 67. Thin-sections K09.2 & K09.3

Synthesis

The micromorphological evidence confirms that the dark bands seen in section to the east of H2 represent separate episodes of plant litter flooring, over which gravel has been laid; at least three episodes were

visible. There is no debris of any sort in the surviving layers so again, the uppermost trampled layer might have been removed before the gravel was laid down.

Context (636) foundation deposit under H2

Micromorphology: (636) is contained within five units in sample K10.3 (Illus 67) which appear to represent distinct lenses of gradually accumulated occupation debris separated by coarse mineral deposits. The coarse component of Unit 1 comprises quartz and feldspars with common cellular charcoal and few lignified plant tissue fragments. Unit 1 has a channel and chamber microstructure although many of the voids have been infilled by dusty clay and fine organic microaggregates thus resulting in low porosity. The unit is poorly sorted but weak parallel banding of the coarse components is visible. The boundary between Unit 1 and 2 is clear. Unit 2 is clearly distinguished from the underlying unit by a platy microstructure and strongly expressed parallel orientation of plant material. Banding of organic, charred and coarse mineral material is evident. The coarse component is dominated by fragmentary amorphous black material. Infilled polyconcave voids may be indicative of trampling. Unit 2 has a clear boundary with the overlying Unit 3, a moderately to well sorted gravel deposit dominated by sandstone rock fragments and quartz with very few charcoal fragments and a single bone fragment. Iron hydroxide pedofeatures are common. Unit 4 comprises a moderately banded deposit with less charcoal than in Unit 2 but greater ash intermixed with burnt peat and common wood and bark fragments. The overlying Unit 5 is a moderately to well sorted gravel deposit analogous to Unit 3. The relatively sharp boundaries between the bands make it likely that the deposition of each band took place fairly rapidly.

Synthesis

(636) can be interpreted as a series of compacted/trampled occupation surfaces separated by a coarse well sorted gravel of probable alluvial origin. This gravel may have been laid down to form a 'clean' floor surface during occupation and/or as a means of raising the ground/foundation level to prevent water ingress.

Context (620) basal fill of coarse sand in H2

Macroplant: The macroplant assemblage from this context contained charred cereal remains including emmer caryopses, chaff and wheat. Other charred material included hazelnut shells, rush capsules and

burnt peat. A small assemblage of waterlogged bracken, wood fragments, weed taxa, moss and peat were also present. The moss from this deposit was probably growing on the wood brought to site. The burnt plant material probably represents the burning of old floor coverings.

Charcoal: 0.8 g of charcoal was recovered from this sample. Alder and hazel were present.

Burnt bone This context produced 22 fragments of burnt bone. Long bone and rib fragments were identified. Only three fragments were completely calcified and the remainder had only been partly charred at a lower temperature.

Micromorphology: This context is present within three of the analysed samples; at the base of sample K10.1, at the top of sample K10.3 and at the top of sample K10.4 (illus 67). (620) as represented in sample K10.1 is a poorly sorted coarse sand deposit. The coarse mineral component comprises common sub-rounded to sub-angular sandstone rock fragments with common quartz, few plagioclase feldspar and few biotite. The coarse organic component comprises dominant charcoal as well as possible charred seeds, burnt bone and few burnt peat. In K10.1 (620) appears to be relatively porous (c 40%) and has an open channel and chamber structure. Common rounded and mammillate excrements are indicative of post-depositional mixing.

(620) as represented within K10.3 is a poorly sorted coarse organo-mineral deposit rich in anthropic indicators, similar to Unit 2 of K10.4. The coarse mineral component reflects that seen in K10.1 but the coarse organic component comprises greater quantities of lignified and parenchymatic plant tissues with a parallel weakly expressed arrangement. Charcoal is common but the variability of the charred component is less than seen in K10.1.

(620) in K10.4 comprises a coarse mineral deposit with anorthic patches of grey ash material, common charcoal, frequent phytoliths and rare charred bone. The composition of the coarse and fine fractions similar to that observed in K10.3 with a greater incidence of ash and plant tissue remains. This sediment has a weakly developed sub-angular blocky structure and the weak banding observed in K10.3 is absent. (620) as observed in K10.4 has a distinct boundary with the underlying deposit (643) suggesting limited post-depositional disturbance.

The presence of excremental fabrics to a greater or lesser degree across all samples of (620) is indicative of some reworking but the evidence for compaction/ trampling seen elsewhere is absent from

these samples. Hearth debris within (620) is present in all samples but in insufficient quantities to indicate either burning *in situ* or hearth clear-out. Micromorphological evidence thus suggests that (620) represents a series of heterogeneous occupation deposits reflecting input of material from a diverse range of sources and subject to variable degrees of compaction and post-depositional reworking.

Synthesis

This deposit is rich in hearth debris, cooking debris and food processing waste, much the same as has been found in the other inorganic deposits on the crannog. The absence of evidence for compaction or trampling suggests that this is not an old floor surface re-used as a lining for the hearth but the use of a 'quarry' of mineral soils into which domestic debris had been mixed.

Context (616) Peat lining in H2

Macroplant: The assemblage from this context was small and poorly preserved. It consisted primarily of amorphous organic material. Waterlogged wood fragments, goosefoot and rush seeds were present.

Insects: The large and generally well-preserved insect assemblage from this sample was very different in composition to all the others examined, and it was clear that this represented peat or turf that had developed naturally on heath or moorland and had been imported onto the crannog.

Outdoor taxa made up almost half of the terrestrial beetles and bugs, and there was a striking number of insects, notably bugs, associated with moorland vegetation and heathers (*Calluna* and *Erica*). This heathland component on its own accounted for 16% of terrestrial insects and consisted of adults and nymphs of *Strophingia ericae*, *Ulopa reticulata*, *Scolopostethus decoratus*, *Macrodera micropterus* and the weevil *Micrelus ericae*. A number of other taxa recorded include moorland among their habitats but are not confined to it; *Stygnocoris sabulosus* (a lygaeid bug represented by at least 19 individuals), is often found under heather in the western parts of Britain (Southwood & Leston 1959, 103), *Olophrum piceum* (14 individuals) is commonly recorded in heaths and bogs, and *Plateumaris discolor* can often be found in large numbers on boggy moorland where the adults are usually found on sedges (*Carex*) (Cox 2007, 78). Six individuals of the ground beetle *Pterostichus diligens* were recorded. Scale insects (Coccoidea) were common but not identified further due to their poor condition, and may have been attached to the stems of heathers. Remains of at least five species of adult click beetles (Elateridae) were

recorded together with numerous larval apices of at least two species. The apices were not identified more closely but many click beetle larvae develop in turf.

Decomposers were considerably less well represented than in all of the other samples (24% of terrestrial forms), some of which were either infrequent or not recorded elsewhere, representing the natural decomposer community of peaty moorland. There was however an extract of the decomposer fauna seen in samples from occupation debris that may have entered the deposit either from adjacent floor litter or as inwash. Foul decomposers were represented by *Cryptopleurum minutum*, *Cercyon pygmaeus*, and a group of scarabaeid dung beetles (18% of the decomposers, 4% of the whole assemblage).

Micromorphology: (616) occupies approximately 90% of sample K10.1 (Illus 67). It is an organic peat deposit dominated by reddish brown to dark brown amorphous organic matter with common to frequent denuded plant tissue fragments. (616) is well humified and relatively homogenous although horizontal banding of decomposed tissue fragments gives this layer a platy microstructure. The presence of vivianite attests to the anoxic conditions under which this deposit formed. The only anthropic indicators identified are very few fragments of fine charcoal which may have been washed or blown into the context. (616) thus appears to comprise a naturally accumulated peat deposit. However, it should be noted that (616) has a clear boundary with the underlying occupation deposit of (620) so it is unlikely that it represents *in situ* peat formation following abandonment because this would have resulted in exposure and subsequent mixing of the underlying (620). It is thus probable that (616) is a redeposited peat brought onto the crannog from the surrounding area.

Synthesis

This deposit is the only 'natural' deposit found on the crannog, without any anthropic content. Peat turves must have been employed to line the sides of the hearth foundation, presumably to provide a fireproof lining.

Context (615) Upper gravel fill of H2

Macroplant: Preservation of the plant material from this context ranged from adequate to good. The food remains consisted of charred spelt caryopses, spelt spikelets, barley caryopses and waterlogged hazelnut shell. Small fragments of burnt peat were also recovered. The waterlogged weed assemblage consisted of knotweed, goosefoot and

chickweed which are probably intrusive.

Charcoal: 1.7 g of charcoal was recovered from this sample. Hazel and oak were present in equal proportions, with a trace amount of alder. Much of the hazel consisted of roundwood fragments.

Burnt bone: This context produced 26 burnt fragments, none of which exceeded 20 mm in size.

Synthesis

As with all the other mineral deposits on the crannog (615) contains hearth debris, cooking and food processing waste.

Phase 3; deposits in the N quadrant

Context (512) amorphous organic matrix

Macroplant: This context was dominated by waterlogged wood chips, amorphous organic material and roots. Waterlogged weed taxa and rushes were also present. The only food remains recovered was a small quantity of charred barley caryopses.

Burnt bone: This context produced 16 fragments of burnt bone all smaller than 10 mm and none of which could be identified.

Insects: Decomposer beetles were very well represented in this sample (72% of terrestrial taxa), with the majority having rather general feeding habits. Diversity of this component was low (α RT = 11, SE = 2) and the most numerous species was *Cercyon analis*. A distinctive building fauna consisted of *Cryptophagus scutellatus*, *Latridius minutus* group, *Atomaria*, *Xylodromus concinnus*, *Crataerea suturalis* and human flea. It seems likely that the matrix around basal timber work (526) included litter from within buildings, probably dumped specifically for ground-raising or leveling. Taxa associated with foul organic matter made up 9% of the decomposers and they included at least three species of *Aphodius*.

Taxa from outdoor habitats made up 11% of the terrestrial assemblage (17% if probable outdoor taxa are also included). *Phyllopertha horticola*, *Dascillus cervinus*, and *Lebia ?chlorocephala* were all from grassland habitats. *Lebia* is a ground beetle found especially where grass forms tussocks, where their larvae are ectoparasitoids of the larvae and pupae of leaf beetles (Chrysomelidae) (Luff 2007, 187–8). The bugs *Livia juncorum* and *Conomelus anceps* are both found on rushes (*Juncus*). It is possible that at some of these insects arrived with turves or in cut vegetation used as floor litter. The potential post-depositional invader *Trechoblemus micros* was represented by two

individuals.

Water beetles and bugs accounted for 9% of the whole assemblage and they included *Oulimnius* and *Hydraena testacea*. Other aquatic invertebrates included caddis fly larvae and larval cases, and statoblasts of *Cristatella mucedo* and ?*Plumatella*.

Context (515) amorphous organic matrix

Macroplant: Both a bulk and monolith sample from this context was examined. Preservation of plant remains was good and the assemblage from both samples was similar in terms of the taxa recovered. Food remains included waterlogged emmer spikelet forks, glume bases and hazelnut shell. There was a large concentration of waterlogged wood fragments, bark and bud fragments, and waterlogged rush seeds and bracken stems/pinnules were also present. Charred material included wood fragments, hazelnut shells, bracken stems/pinnules and peat. The waterlogged weed assemblage was varied and included taxa from disturbed/waste ground. Other finds included peat and roots.

Charcoal: 0.7g of charcoal was recovered from this sample. It consisted mainly of hazel roundwood with some oak.

Insects: This sample produced a particularly large assemblage of 360 beetles and bugs of 126 taxa dominated by decomposers (α RT = 13, SE = 1). *Oxytelus sculptus* was the most numerous beetle with 51 individuals, and *Cercyon analis* and *Carpelimus bilineatus* agg. were very common. As noted elsewhere, *O. sculptus* is typically indicative of open-textured, nutrient-rich material and its abundance here may suggest the re-deposition of discarded litter from within buildings as part of the ground raising and levelling process. Taxa associated with dry mouldering material – *Latridius minutus* group, *Enicmus* and *Cryptophagus* – made up 6% of the decomposers. Foul decomposers consisted of *Cercyon terminatus*, *C. haemorrhoidalis* and a number of scarabaeid dung beetles.

Woodworm beetle (*Anobium punctatum*) may have infested structural timber but equally could have been imported within dead, dry wood or twigs with several other wood-related beetles (*Anobium fulvicorne*, *A. inexpectatum* and the weevil *Acalles*). *A. fulvicorne* is most often found in association with oak (*Quercus*) (Hurka 2005), while *A. inexpectatum* is known only from old ivy (*Hedera*).

Ground beetles (Carabidae) were relatively common by the standards of other samples from this site. *Pterostichus diligens*, *Pterostichus minor* and *Pterostichus nigrita/ rhaeticus* all occur in damp habitats while *Bembidion obtusum* and *Calathus fuscipes* were both

indicative of open ground in relatively dry situations. *B. obtusum* is especially found on cultivated ground (Luff 1998, 68). Several heathland insects were recorded: the weevil *Micrelus ericae*, the jumping plant louse *Strophingia ericae* and the lygaeid bug *Scolopostethus decoratus* pointing to the use of moorland turf and/or peat in the structure. Other plant-associated insects included *Sitona* found on Papilionaceae, *Apion curtirostre* found on a wide variety of docks (*Rumex*), and three species with turf dwelling larvae – *Serica brunnea*, *Dascillus cervinus* and *Phyllopertha horticola*. The last of these was particularly well represented by nine individuals. *Dryops* was suggestive of wet waterside mud. Aquatics made up 8% of the whole assemblage and *Oulimnius* was the most numerous within the group with 11 individuals. *Hydraena testacea* and poorly preserved remains of several other taxa were also recorded.

Micromorphology: (515) is located at the base of sample M09.2 (Illus 68). It is a heterogeneous compact organomineral clay deposit with a course:fine ratio of 35:65. The context has a channel and chamber microstructure with an open porphyric related distribution. The coarse material is randomly arranged with some apparently random clustering of plant material which comprises few parenchymatic, very few lignified tissue fragments and frequent large charcoal (1000 µm–2 cm). Common smaller fragments (100–1000 µm) of charcoal are distributed randomly throughout matrix. The coarse mineral component comprises common to frequent phytoliths, common quartz and few subrounded rock fragments.

Anthropic indicators in the form of charcoal, clustered ash, burnt peat and possible charred cereal grains are common to frequent. Post-depositional reworking is evident at the top of the unit in the form of few patches of smooth ellipsoidal organo-mineral mite excrements and very few pseudomorphic voids. The context becomes more compact with less evidence of reworking with depth and the presence of common pedofeatures towards the base of the context is indicative that biological postdepositional reworking is limited to the upper parts of the context. The pedofeatures noted at the base of the slide include very few anorthic patches of burnt soil/peat, common iron depletion coatings on voids and very few impregnative iron nodules. The horizontal banding that is present in the apparently deliberately laid deposits from elsewhere across the sample sequence is absent and it appears that (515) represents a gradual accumulation of organic material and general human occupation debris. The presence of horizontally oriented vughs within the lower levels of the context is an indication that this layer has been subject to compaction: this may

have been caused by trampling. Clay coatings/infillings also occur within this layer and may be indicative of compaction or inwashing of fines during flooding.

Context (516) amorphous organic matrix

Macrophant: A bulk and kubiena sample from this context were analysed and both produced similar results in terms of plant taxa and preservation. The only food remains present were waterlogged hazelnut shell. A small amount of waterlogged wood and bark fragments, rush seeds and weed taxa were present. Charred material included some wood fragments and grass caryopses.

Charcoal: 54.3g of charcoal was recovered from this sample. The species proportions are as follows; hazel 78%, alder 7%, willow 6%, birch 4% and oak 3%. Some 87.5% of this assemblage consisted of roundwood fragments.

Burnt bone: This context produced 20 fragments of burnt bone one of which one was identified as a rib belonging to a large mammal. The remainder of the assemblage was smaller than 10 mm.

Micromorphology: This context is represented in the base of sample K09.3 (Illus 68). It is a poorly sorted silty sand with a weakly separated granular structure with randomly oriented internal components. (516) has a higher proportion of fine organic material than overlying layers and a coarse:fine ratio of 30:70. Coarse components comprise common quartz, very few phytoliths, few parenchymatic tissue fragments and very few organic residues. Fine charcoal is common throughout the general matrix but there is insufficient charcoal and ash within this deposit to support an interpretation of hearth debris. There are very few excremental pedofeatures indicating limited post-depositional exposure and pedoturbation. The pedofeatures present are restricted to very few pseudomorphous voids and very few iron oxide coatings on voids. This context probably represents general occupation debris though the absence of defining pedofeatures and the granular structure prevent further interpretation regarding the nature of occupation. The boundary between (516) and the overlying (506) is diffuse.

Synthesis of (512), (515) & (516)

These deposits were interpreted as a naturally-accumulated organic matrix which built up around and over the timber framework which formed the foundation layer across of the crannog. The lack of compaction and structure seen in the thin-sections through (515) and (516) support this interpretation, as do the insect taxa which suggest a

more open environment. Some of the taxa suggest a heathland component, possibly turves but there is no evidence for the use of turves in the macroplant assemblage. Peat is present but some of it is burnt so it probably represents fuel debris rather than material brought onto the crannog to build up the foundation deposits. The deposits are all relatively rich in human debris, in the form of hearth and cooking waste, and discarded floor coverings some of which had been burnt, so this may have been an open area where waste was dumped. The large decomposer element in the insect assemblages confirms the presence of foul floor coverings and midden-type material.

The quantities of carbonised hazel roundwood in (516) are reminiscent of the charcoal component in (513) and it is possible that this represents part of the same collapsed hurdle fence.

Context (501) gravel deposit interleaved with hearth debris

Macroplant: The largest plant component from this context was root fragments which appeared to be modern and intrusive. The remainder of the assemblage was minimal and consisted of waterlogged wood chips, fat hen and goosefoot.

Burnt bone: This context produced 10 fragments of burnt bone of which one was identified as a humerus. The remainder of the assemblage was smaller than 10 mm.

Context (502) gravel deposit interleaved with hearth debris

Micromorphology: (502) is present as two units in both sample K09.2 and sample K09.3 (Illus 68). There are two microfabrics within Unit 1 of K09.2 (described below) but (502) displays basic similarities across the units analysed. (502) is a poorly sorted randomly oriented organo-mineral mixed deposit, the coarseness of which varies widely throughout the samples. The coarse component is dominated by quartz with common sandstone fragments, feldspar and chlorite. Anthropogenic components in the form of charcoal, calcitic ash and burnt peat are common. Impregnative patches of phytolith rich organic material and anorthic patches of a dark greyish brown microfabric (MF2) are common. MF2 is dominated by ash, with frequent burnt peat fragments and is interpreted as hearth debris.

With the exception of patches of MF2 which occur throughout the context, (502) contains insufficient ash and charcoal remains to be hearth debris and can be interpreted as a general occupation deposit incorporating material from a wide range of sources but lacking the signs of resurfacing and trampling observed elsewhere. The absence of excremental features and general heterogeneity indicate that it was

deposited relatively rapidly and not left open to mixing by soil fauna or flora for any length of time. Common planar voids are indicative of slipping/ shrinkage. Common iron hydroxide depletion coatings and voids partially infilled with fine organic material are indicative that the context has been subject to postdepositional wetting and drying and translocation of fine material possibly as a consequence of flooding.

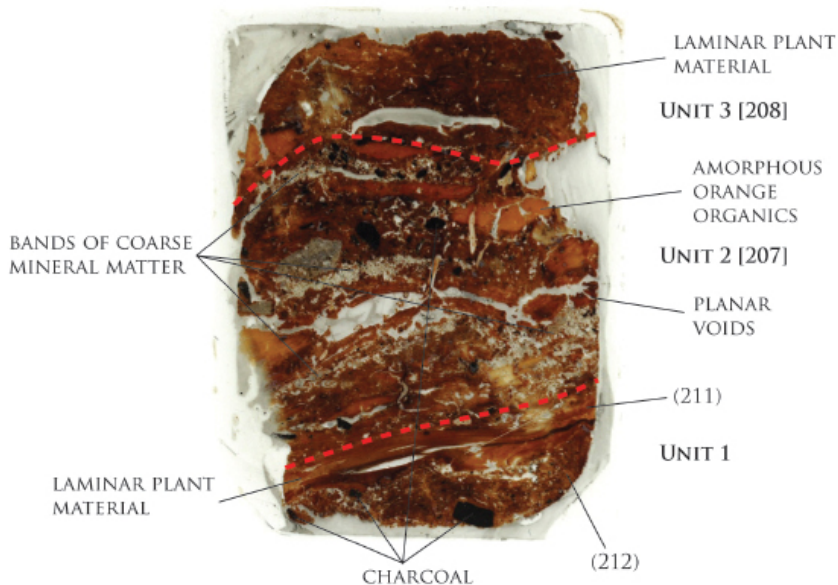
Context (504) discrete deposit of hearth debris

Macroplant: The macroplant assemblage was small and consisted of waterlogged wood fragments, rush seeds, goosefoot and thistle. The goosefoot and thistle probably grew on site after colonising disturbed ground.

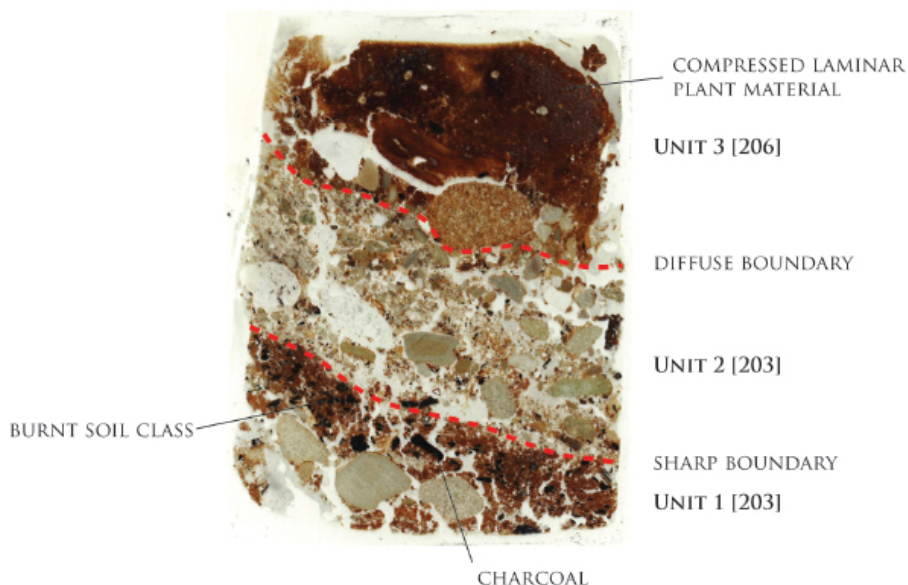
Charcoal: 12.1 g of charcoal was recovered from this sample. The species proportions are as follows; hazel 53%, oak 23%, birch 20%, alder 2% and willow 2%. Some 66% of the hazel consisted of roundwood fragments.

Burnt bone: This context produced 83 fragments of burnt bone which had been exposed to varying temperatures.

K08_4



K08_2



Illus 68. Thin-sections K08.4 & K08.2

Synthesis of (501), (502) & (504)

As with the other mineral deposits on the crannog hearth debris and cooking waste has been incorporated. The onsite observation that there were discrete lenses of hearth debris is confirmed by the micromorphological evidence, which also shows that these deposits

were dumps not surfaces.

Phase 4; Structure 3

Context (212) brushwood bundles

Macroplant: The macroplant assemblage is dominated by waterlogged wood fragments, weed taxa from disturbed ground, rushes and amorphous organic material. A small quantity of burnt peat was also present.

Charcoal: 0.8 g of charcoal was recovered from this sample. Hazel, oak and birch were present.

Insects: Decomposer beetles dominated the terrestrial assemblage and their diversity was low (α RT = 11, SE = 2). *Oxytelus sculptus* was the most abundant species followed by *Cercyon analis* and *Carpelimus bilineatus* agg.. *O. sculptus* is typical of open-textured nutrient-rich material and its present day habitats are listed as compost heaps and dung heaps (Lott 2009, 38). A suite of taxa typical of dry mouldering material within buildings (*Latridius minutus* group, *Atomaria* and *Cryptophagus scutellatus*) made up 8% of the decomposers. Human flea was also recorded. *Cercyon haemorrhoidalis* and *C. terminatus*, together with *Geotrupes* s.l. and three *Aphodius* species contributed a foul matter component (9% of the decomposers). Twelve per cent of terrestrial taxa were from outdoor habitats (17% if probable outdoor forms are included). They included *Phyllopertha horticola*, *Prasocuris phellandrii* and *Notaris acridulus* found on waterside Ranunculaceae and semi-aquatic grasses respectively, and *Trechus obtusus* or *quadristriatus*. Aquatics made up 6% of the whole assemblage and included *Hydraena nigrita* found in gravel and stones in flowing water, often in shaded locations (Friday 1988, 149). Statoblasts of *Cristatella mucedo* and ?*Plumatella*, and fragments of caddis larvae were present.

Micromorphology: (212) is located at the base of sample K08.4 (Illus 69) and comprises two units; the lower Unit 1 is a mixed heterogeneous deposit consisting of organic laminar plant material embedded within a matrix of coarser mineral (possibly (211) – see below) and with common fragmentary charcoal (1–10 μ m) and few cellular charcoal (10–100 μ m). Unit 1 has a channel and chamber microstructure and porosity of c 10%. The upper Unit 2 is composed entirely of compacted laminar plant material laid on top of the coarser mineral material below. There are no anthropic indicators and very

few voids giving this unit a porosity of c 1–2%. The boundary between these two units is sharp indicating that the plant material was laid and compacted on top of Unit 1 in a relatively short period of time. The micromorphological evidence is thus consistent with the interpretation of this context as plant matting/organic floor covering.

Synthesis

During excavation bundles of small hazel roundwood (see *Structural wood*) were clearly identifiable but the combined ecofactual evidence for this deposit suggests that it also included layers of plant litter like rushes and other semi-aquatic grasses. Like other floor coverings this one contains only trace amounts of hearth debris and no food processing waste. The insect assemblage contains the suite of taxa typical of decaying plant litter floor coverings. This deposit was initially interpreted as part of a sequence of sub-floor deposits but the insect evidence raises the possibility that (212) could have been an active floor surface itself, which subsequently became unpleasantly foul. The alternative explanation is that old floor litter and midden-type material were used in the build-up of the sub-floor surface.

Context (108) = (208) = (510) = (629) plant litter layers

Macroplant: This deposit contained a relatively large concentration of wood fragments. There was a smaller amount of waterlogged bark, leaf and bracken stem/pinnule fragments, as well as weed taxa originating from waste ground and heath/moorland environments. The only food remains recovered were a small quantity of raspberry seeds. These may have originated in human faeces (ie Johnston & Reilly 2007, 56) although there is no other evidence that cess had become incorporated into the deposit.

Charcoal: 0.7 g of charcoal was recovered from this sample. Alder, birch, hazel and oak were present.

Micromorphology: This context is located at the bottom of sample K07.3 ([Illus 70](#)) and is a moderately sorted and banded silt dominated by organic matter. The coarse fraction comprises few sub-rounded sandstone fragments and common quartz. The lower part of (108) comprises common amorphous yellow and black fine organic matter interleaved with frequent large lignified and parenchymatic plant tissue fragments with moderate parallel orientation. The surface or upper part of (108) is comprised almost entirely of horizontally banded fresh tissue fragments and has a sharp boundary with (102) above. The presence of some fragments of charcoal and bone within this upper layer may result from infiltration of overlying sediment

(102) down into the loose mat of vegetation whilst still fresh or during flooding (see below).

Surviving evidence for horizontal banding in the tissue fragments indicate that they were deposited in a fresh condition and decomposed *in situ*. The presence of both impregnative iron hydroxide coatings and hypocoatings and depletion pedofeatures is indicative of relatively prolonged water saturation (Lindbo *et al* 2010) possibly caused by post-depositional flooding which may be responsible for the inwashing of fine charcoal and ash into void spaces. The micromorphological evidence thus suggests that these organic layers accumulated over a relatively short period of time, possibly deliberately lain as 'clean' vegetation matting or as a means of raising the floor level.

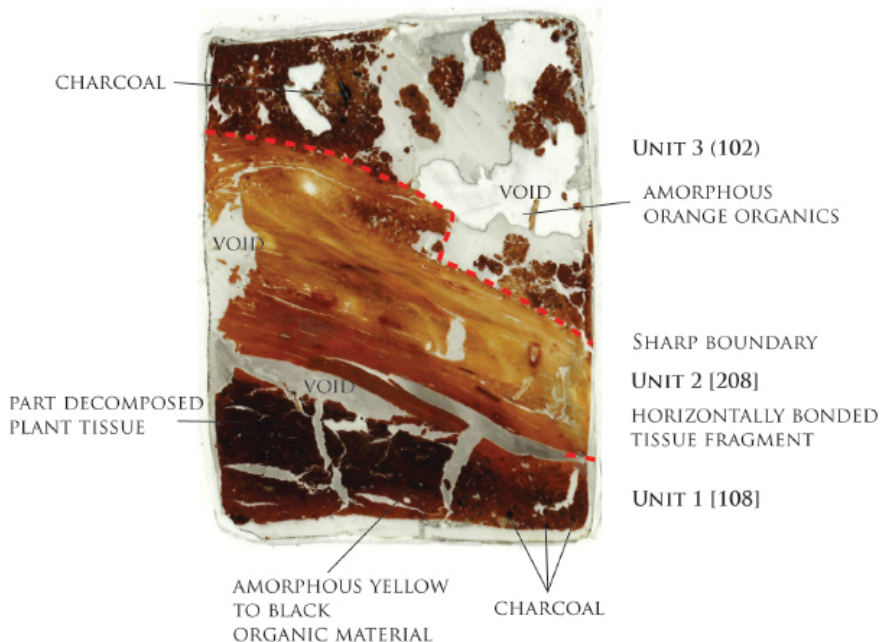
Context (208) = (108) = (510) = (629) plant litter layers

Macropant: The assemblage consisted of waterlogged fat hen, goosefoot, sedge, sheeps sorrel, wood fragments, roots and a large concentration of amorphous organic material. The only food remains present was a small quantity of waterlogged hazelnut shell.

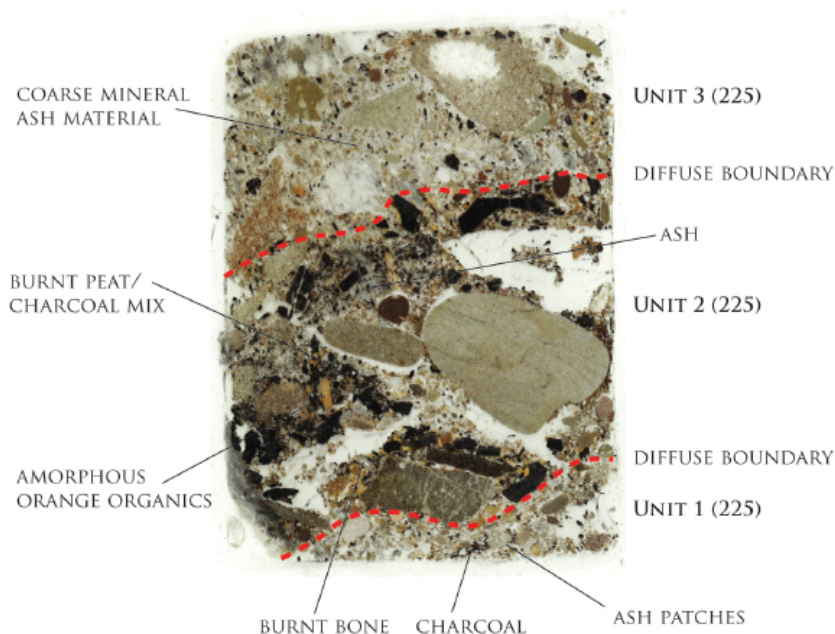
Charcoal: 1.4 g of charcoal was recovered from this sample. Oak, alder and hazel were present.

Micromorphology: This context is located in the top of sample K08.4 (Illus 69) and is similar in composition to (211) but significantly more compact with a porosity of 1–2%. (208) is a heterogeneous compacted organomineral deposit containing bands of amorphous fine organics and coarse mineral materials interleaved with horizontal plant tissue remains. The fine fraction is predominantly organic and is composed of amorphous yellow to black material with intercalations of dusty clay. The few voids visible have dusty silt and clay coatings. Anthropoc material comprises common charcoal and few burnt peat fragments.

K07_3



K08_1



Illus 69. Thin-sections K07.3 & K08.1

The laminar plant material probably represents a series of floor

coverings which have been highly compacted as a consequence of trampling. The presence of ash and sediment clasts commonly within laminar void spaces is likely to have been inwashed or blown into the deposit or in some cases incorporated through trampling (Macphail & Cruise 2001). These laminar plant materials appear to have been laid on top of mineral coarse sand surfaces interleaved with mineral silty clay containing frequent anthropogenic indicators. It is possible that the mineral material is an attempt to add a 'clean' gravel base onto which to lay clean plant matting or perhaps as a means of raising the ground level. The occurrence of finely comminuted amorphous and carbonised organic material, as well as unoriented dusty clay coatings are indicative of post-depositional disturbance possibly caused by flooding which is likely to at least in part have altered original sediment features (French 2003, 88–95).

Context (510) = (108) = (208) = (629) plant litter layers

Macroplant: The plant assemblage from this context was dominated by amorphous organic material. Small quantities of waterlogged wood fragments, knotweed, goosefoot, rush seeds, roots and peat were present. Some of the peat was burnt.

Burnt bone: This context produced 23 burnt fragments, together with a single unburnt rib fragment. The only other identifiable bone was a phalange but species could not be confirmed. The rest of the assemblage consisted of fragments smaller than 10 mm.

Insects: The most obvious insect remains in this sample were numerous fly puparia, mostly of house fly. Their abundance relative to other remains in this small 'spot' sample (original volume 0.2 litres) suggests that floor litter in this area had become particularly foul. An assemblage of moderately preserved beetles was also present with *Cercyon analis* and *Carpelimus bilineatus* agg. the most numerous individual taxa. Bearing in mind the small size of this sample, the concentration of beetle remains was high and may have been rather greater than in many of the other samples (an estimated 220 individuals per litre of sediment).

Context (629) = (108) = (208) = (510) plant litter layers

Macroplant: This context contained a small concentration of amorphous organic material together with waterlogged wood fragments, knotweed, goosefoot, rush seeds, roots and peat. Some of the peat was burnt. The only food remains recovered were waterlogged hazel shell fragments.

Insects: Decomposer beetles accounted for well over half of the

terrestrial assemblage (α RT = 13, SE = 2). Dry decomposers and other taxa typical of ancient buildings were well represented by *Latridius minutus* group, *Enicmus*, *Cryptophagus scutellatus*, *Atomaria*, *Xylodromus concinnus* and human flea. *Cercyon unipunctatus*, *Geotrupes* s.l. and three species of *Aphodius* associated with foul matter accounted for 10% of the decomposers. Plant associated species included *Dascillus cervinus* and *Phyllopertha horticola*, both associated with grassland, and *Notaris ?acridulus* found on semi-aquatic grasses. Aquatics were a little more common than in most other samples (9 taxa accounting for 11% of the whole assemblage). Among them was *Anacaena globulus* found where there is flowing water and damp shaded ground (Friday 1988, 148). Caddis larval fragments and cases and statoblasts of *Cristatella mucedo* and *?Plumatella* were present.

Synthesis for (629) = (108) = (208) = (510)

All the separate contexts displayed the laminated nature representative of plant litter floor coverings but it is clear from the analyses that some areas were more advanced in their decomposition than others. While bracken and leaves could be identified in (108) there was no such macroplant remains in (629). However, the insect assemblage from (629) hints at the presence of grasses and semi-aquatic grasses, and at the dry mouldering conditions so common in this type of flooring. Conditions in parts of the building were obviously very foul, as indicated by the house fly infestation seen in the spot sample from (510). As with the other floor coverings there is very little evidence of hearth debris and cooking waste. What there is reflects discrete patches presumably accidentally dropped; raspberry seeds in (108), hazelnut shells in (208), burnt bone in (510), and small amounts of charcoal in (108) and (208).

The micromorphological evidence from (208) indicates that sand was scattered over the old plant litter, possibly after the soiled upper material had been removed, to form a clean surface onto which to lay fresh litter.

Context (207) floor surface

Macroplant: The plant remains from this context were dominated by large quantities of waterlogged bark, wood fragments and rushes. Small quantities of sedge and grass caryopses were also present. The remainder of the assemblage included waterlogged knotweed and goosefoot which are probably intrusive.

Charcoal: 1.8 g of charcoal was recovered from this sample. The species composition was as follows; oak 39%, alder 28%, hazel 22%

and willow 11%. A small amount of the hazel and alder was roundwood.

Insects: Insect remains were abundant but erosion of sclerites was advanced and a majority were pale and thinned. The terrestrial assemblage was dominated by decomposers and *Cercyon analis* and *Carpelimus bilineatus* agg. were particularly common. Diversity was relatively low, albeit a little higher than in most other samples (α RT = 14, SE = 2).

A minimum of seven *Phyllopertha horticola* were recorded from this sample, and other outdoor taxa included another small chafer *Serica brunnea*, several click beetles (Elateridae) that were not identified further, probably two species of *Cyphon*, *Paranchus albipes* found at the margins of fresh water, and *Abax parallelepipedus* found in shaded well-vegetated places (Luff 2007, 116). *Dryops* was suggestive of waterside mud.

Aquatics accounted for 7% of the whole assemblage. The most common within the group was *Oulimnius* (seven individuals), and *Hydraena testacea*, *Agabus bipustulatus* and *Anacaena ?globulus* were also identified. Statoblasts of *Cristatella mucedo* were common and a single poorly preserved water flea ephippium (Cladocera: resting egg) was noted.

Micromorphology: (207) is a moderately sorted organic sandy clay in K08.4 (Illus 69). The course:fine ratio varies from 25:75 to 40:60 according to banding. The coarse material has strongly expressed parallel orientation and a banded distribution. The coarse mineral component comprises common quartz, few plagioclase and orthoclase feldspars with few phytoliths and very few patches of rounded birefringent ash crystals. The coarse organic component comprises few lignified tissue fragments, common fragmentary charcoal (10–100 μ m) and common large cellular charcoal (1000 μ m–5 mm). (207) is similar in composition to (208) but has been subject to greater post-depositional disturbance as indicated by common arthropod excremental fabrics which have created a weakly expressed channel and chamber microstructure. Few pseudomorphous voids and partial infilling of voids with fine organic material were also noted. The boundary between (212) and (207) is diffuse indicating that (207) was exposed for a sufficient period following its deposition to allow for mixing with underlying layers.

Synthesis

The on-site interpretation of this deposit was that it was a very decomposed version of the plant litter layers

(629)=(108)=(208)=(510) and the condition of the insect assemblage tends to confirm the advanced state of decomposition. The presence of rush, sedge and grass caryopses also suggests that the matrix was originally plant litter of the composition commonly seen in the better-preserved floor coverings. Some hearth debris had become trampled into the floor coverings.

Context (203) = (206) = (209) mixed spreads of flooring material

Macroplant: The waterlogged assemblage was small and restricted to knotweed, goosefoot and rush. Charred material consisted of a small quantity of hazelnut shell. Modern invasive roots were also present.

Charcoal: 2.2 g of charcoal was recovered from this sample. The species proportions are as follows; alder 45%, oak 35% and hazel 20%.

Burnt bone: This context produced 67 small burnt fragments, none of which could be identified to element and or species.

Micromorphology: (203) is located in sample K08.2 (Illus 69) and comprises two distinct units. The basic components of the two units are similar; the coarse mineral material in both is dominated by quartz with few sub-rounded sandstone fragments and the coarse organic material comprises very few yellowish red plant tissue fragments, few cellular charcoal (100–1000 µm) and few fragmentary charcoal (10–100 µm). Burnt organo-mineral material occurs as sub-rounded clasts and also within microaggregates. The coarse material arrangement has 45° orientation weakly expressed. Larger mineral grains are concentrated in bands giving the context a banded appearance, while phytoliths are patchily but apparently randomly distributed. The lower part of the context (Unit 1) has a crumb microstructure whereas the upper part (Unit 2) has an intergrain microstructure.

The nature of the sharp boundary between the two units comprising (203) and dipping nature of coarse mineral fragments indicates that Unit 1 was dumped directly onto Unit 2 although the weak banding is indicative that it may have been deposited over more than one episode. It is likely that the anthropic indicators including the charcoal and burnt peat fragments do not represent *in situ* burning and that they have been incorporated into the unit through physical mixing prior to deposition, although it is not possible to tell if this was intentional or through natural agencies. This layer of coarse mineral and sand gravels between two organic laminar deposits represented by (206) is consistent with the interpretation of a series of heterogeneous occupation deposits spread over floor surfaces as a ‘waterproofing’

gravel to raise the ground level.

Context (206) = (203) = (209) mixed spreads of flooring material

Macroplant: The waterlogged macroplant assemblage consisted of wood fragments, goosefoot, and rush seeds. Modern invasive roots were also present.

Charcoal: 13.8 g of charcoal was recovered from this sample. The species proportions are as follows; alder 46%, oak 46%, birch 2%, hazel 2% and willow 2%.

Burnt bone: This context produced 13 burnt bone fragments, of which one was identified as a skull fragment.

Micromorphology: (206) occurs widely across the site. It is a variable heterogeneous anthropogenic peat and appears in sample K08.2 ([Illus 69](#)). The coarse component is randomly sorted and oriented and weakly banded. The coarse mineral component comprises frequent quartz, common phytoliths and very few sub-rounded-sub-angular sandstone rock fragments. The coarse organic component comprises common horizontally layered strong brown to brownish yellow lignified and parenchymatic tissue fragments, common fragmentary charcoal (100–1000 µm) and few large cellular charcoal (1000–10000 µm). The fine organic material is comprised of reddish brown and yellow amorphous material which contributes to the yellowish red colour of the matrix. The context has a platy microstructure, weakly developed pedality and close porphyric related distribution.

The lower unit of (206) comprises a mostly quite amorphous yellowish brown peat with frequent strands of horizontally lain plant tissue. Despite being relatively well humified and having a generally pellet form, clear horizontal lamination is still evident. Bands of charcoal are present but in close association with unburnt cellular organic material and as such they are not the product of *in situ* burning and are likely to have been trampled, blown or washed into the accumulating sediment from adjacent areas. Compaction and possible trampling of (206) is indicated by clay infillings of polyconcave voids (see Fitzpatrick 1993). After the deposition of clay, it is possible that water ingress has caused infills of yellow amorphous substances thus accounting for the frequent infilled voids (French 2003).

Context (209) = (203) = (206) mixed spreads of flooring material

Macroplant: The waterlogged macroplant assemblage consisted of wood fragments, rush seeds and weed taxa from damp and disturbed ground. The food remains from this context consisted of charred

cereal caryopses, a waterlogged emmer glume base and hazelnut shell.

Charcoal: 15 g of charcoal was recovered from this sample. The species proportions are as follows; hazel 51%, oak 39% and birch 10%. Some 32% of the hazel consisted of roundwood fragments.

Burnt bone: This context produced 69 small burnt fragments, none of which could be identified to either element or species.

Synthesis of (203) = (206) = (209)

The scarcity of waterlogged macroplant remains in these deposits is indicative of the poor preservation encountered particularly in the northeast quadrant of the site, which may have remained above the water level to a greater extent than other parts of the crannog and subsequently dried out more frequently. Nonetheless, it is clear from the micromorphological analyses that the same series of laminated plant litter layers interspersed with lens of mineral soil were also present in this structure, although the degree of decay has resulted in a very patchy mixed spread rather than clearly defined layers. All the deposits are relatively rich in hearth debris and cooking waste, with a scatter of burnt bone and charcoal throughout, and hazelnut shell and cereal remains concentrated in (209).

Context (202) patches of grey clay

Macroplant: The matrix of this context consisted mostly of modern roots and amorphous organic material. The only identifiable plant material was a small quantity of waterlogged goosefoot and rush seeds.

Charcoal: 3.6 g of charcoal was recovered from this sample. The species proportions are as follows; alder 47%, oak 31% and hazel 21%.

Burnt bone: This context produced 10 fragments of burnt bone, one of which was identified as a long bone fragment belonging to a large mammal. The remainder was all smaller than 10 mm.

Synthesis

(202) was interpreted as part of the same mixed spread of floor deposits as (203) = (206) = (209) and similarly contains mainly hearth and cooking debris.

Context (205) hearth debris

Macroplant: The plant assemblage was dominated by waterlogged wood fragments, nettles, goosefoot, docks and thistles, grass

caryopses, sedge, plantain, rush seeds and capsules. The only food remains from this context were a small number of poorly preserved charred cereal caryopses.

Charcoal: 12 g of charcoal was recovered from this sample. The species proportions are as follows; oak 48%, hazel 28% and alder 23%.

Burnt bone: This context produced 23 small burnt fragments.

Synthesis

The presence of charred cereals, burnt bone and charcoal confirm the on-site interpretation of hearth debris. The presence of grasses, sedges and rushes also suggest that floor coverings were being burnt on the hearth.

Context (215) gravel deposit

Macroplant: This context contained a large quantity of waterlogged rush seeds and herbaceous plant stems, which could not be identified to species but, given the quantities of rush seeds present, are probably rush stems. The plant stems formed a distinct layer reminiscent of the floor coverings found elsewhere on the site. Waterlogged wood fragments, knotweed, goosefoot and, sedge were also present along with small quantities of peat.

Charcoal: 8.3g of charcoal was recovered from this sample. The species proportions are as follows; hazel 67%, oak 19%, willow 8%, alder 3% and birch 3%. Some 44% of the hazel consisted of roundwood fragments.

Burnt bone: This context produced 43 small burnt fragments, most of which were smaller than 10 mm and could not be identified. The bone had been burnt at different temperatures.

Synthesis

The contents of this spread suggest that plant litter floor coverings, as well as hearth debris and cooking waste had been mixed in with the gravel. This is similar in content to the other mineral deposits encountered on the site, such as (520) and (511).

Phase 5; the decay horizon

Context (102) amorphous organic matrix

Micromorphology: This context is located in K07.3 ([Illus 70](#)). The

coarse component is randomly arranged and the mineral component comprises common subrounded-sub-angular quartz with very few plagioclase feldspar, hornblende and biotite. Few phytoliths are present within the general matrix. Within the matrix are common anorthic patches of dark greyish brown (10YR 4/2) fabric

c.500µm diameter within which are frequent calcitic ash, dominant micro-charcoal, frequent phytoliths and few plant fragments. (102) has an intergrain microaggregate structure and appears to have been exposed for sufficient time to allow for some soil fauna and flora mixing as indicated by common ellipsoidal and mammillate excremental fabric.

The general composition of (102) (common anorthic dark grey ash patches, large charcoal fragments and iron hydroxide coatings around voids) displays similarities to other occupation layers from across the site. The highly humified organic residues have not been burnt, so they are not fuel ash. The high degree of humification has left limited structural information with which to identify the plants originally present. Recognisable remains include epidermal and vascular tissues derived from herbaceous materials which are commonly most resistant to decomposition. The horizontal banding in the tissue fragments indicates that they were deposited in a fresh condition and decomposed *in situ*. Indeed the very few pseudomorphic voids identified included remains of partially decayed material. The associated occurrences of elongate phytoliths alongside the horizontal planar voids could be indicative that the organic material was used as a floor covering or mat. Iron staining observed within (102) could be a result of trampling and the organic matter acting as a hydraulic barrier (Macphail & Goldberg 2010, 598).



Illus 70. Puffball from [521]

Context (210) amorphous organic matrix

Macroplant: The major component from this deposit was amorphous organic material together with a small volume of roots and peat. Waterlogged bark, wood fragments, goosefoot, rush and grass caryopses were also present.

Charcoal: 1.1g of charcoal was recovered from this sample. The species proportions are as follows; hazel 71% and alder 29%. Some 64% of the assemblage consisted of roundwood fragments.

Insects: Remains of beetles and bugs were abundant in this horizon, but rather poorly preserved. Erosion was advanced for a majority of sclerites and many had become pale and thinned with loss of three dimensional structure. Two thirds of the terrestrial component consisted of decomposers, many of which were synanthropic to some degree. The diversity of the decomposer group was low however (α RT = 9, SE = 1). There were strong indications that the deposit included material relating to the occupation of the crannog, notably from beetles associated with rather dry mouldering vegetable matter and characteristic of litter within ancient buildings. *Cryptophagus scutellatus*, *Atomaria*, *Latridius minutus* group, and two other *Cryptophagus* species accounted for 19% of the decomposers and 12%

of the terrestrial assemblage. *Xylodromus concinnus*, *Crataerea suturalis* and human fleas are also typically associated with ancient buildings. The bulk of the rest of the decomposer component consisted mainly of generalists found in decomposing plant debris, among which *Cercyon analis* and *Carpelimus bilineatus* agg. were particularly abundant. Taxa associated with foul matter (*Cercyon haemorrhoidalis*, *C. terminatus*, and several scarabaeid dung beetles *Geotrupes* s.l. and *Aphodius* spp.) made up 4% of the decomposers.

Two members of the woodworm family (*Grynobius planus* and an *Anobium* species) could have been imported onto the crannog with wood but equally may have come from nearby trees or ivy. Rotten timbers and decaying wood within the deposit may have been exploited by the larval stage of *Denticollis linearis*, a click beetle occurring in woodland and scrub (Harde 1984, 174).

Beetles from outdoor habitats made up a relatively small proportion of the terrestrial assemblage (only 9% even if probable outdoor taxa are included), lending support to the notion that the deposit largely accumulated as litter within buildings, rather than as build-up after abandonment. While some of the outdoor species recorded could reflect the immediate surroundings of the site, it is likely that at least some were imported with material such as peat or turves brought onto the crannog as fuel or for structural use. The ground beetles *Pterostichus diligens* and *Agonum* cf. *fuliginosum* occur in moist habitats such as marshes, damp grassland and moorland. The chafers *Phyllopertha horticola* (represented by three individuals) and *Serica brunnea* have turf-living larvae and occur in grassland on light soils. Insects from waterside plants were represented by *Prasocuris phellandrii* which feeds primarily on waterside Ranunculaceae, especially marsh marigold (*Caltha palustris*) (Cox 2007, 144), and *Notaris aridulus* found on semi-aquatic grasses, especially reed sweet-grass (*Glyceria maxima*) (Morris 2002, 38). Both may represent plants growing locally, and may have been imported with plant material used as flooring litter.

Aquatic beetles and bugs accounted for 5% of the whole assemblage, with *Oulimnius* the most numerous of the group. Statoblasts of *Cristatella mucedo* and ?*Plumatella* were common.

Context (506) amorphous organic matrix

Macroplant: The assemblage was dominated by amorphous organic material and roots. A small quantity of waterlogged wood fragments, rushes, goosefoot and dock were also present. The weed taxa such as the goosefoot and dock could easily have grown on this part of the site as an intrusive weed especially if the ground was disturbed. The only food remains recovered was a waterlogged emmer glume base.

Charcoal: 18.9g of charcoal was recovered from this sample. The species proportions are as follows; hazel 29%, oak 25%, alder 25% and birch 21%. Some 29% of the assemblage consisted of roundwood fragments.

Burnt bone: This context produced 31 burnt bone fragments, most of which were smaller than 10 mm.

Micromorphology: (506) is represented in K09.2 ([Illus 68](#)) and M09.2 ([Illus 64](#)). (506) as present in K09.2 is a relatively heterogenous deposit dominated by reddish brown amorphous fine organic material with frequent macro-charcoal. The coarse mineral component comprises few quartz, very few sub-angular sandstone (lithic greywacke) fragments. Frequent equant and elongated phytoliths are associated with the coarse organic material. The moderately expressed parallel orientation of the denuded plant tissue indicates that it was deposited in a fresh condition and decomposed *in situ*. The red colour of the context is probably due in part to the presence of oxidised irons in the clay and the process of rubefaction, where the sediment dried out and was then subsequently waterlogged. Common excremental features and vughy moderately granular microstructure are all indicative of post-depositional reworking suggesting that (506) was exposed to the elements for a relatively long period.

(506) in M09.2 has a higher proportion of coarse mineral material comprising common quartz, common sub-rounded to sub-angular rock fragments and very few phytoliths. The coarse organic component comprises dominant large charcoal (1000 μm –2 cm) and frequent smaller fragments (100–1000 μm) throughout the matrix. Few parenchymatic and common lignified tissue fragments are also present. As with sample K09.2 (506) in M09.2 has common excremental features and granular crumb microstructure with open porphyric related distribution.

Context (517) amorphous organic matrix

Macroplant: The assemblage from this context was small and preservation ranged from poor to adequate. A small amount of

waterlogged wood chips and weed taxa, together with some charred wheat, cereal caryopses and burnt peat were present.

Charcoal: 0.9g of charcoal was recovered from this sample. The species proportions are as follows; hazel 83% and oak 17%.

Burnt bone: This context produced ten fragments of burnt bone all smaller than 10 mm and none of which could be identified.

Context (601) amorphous organic matrix

Micromorphology: (601) comprises two units located in the upper part of sample M10.1A (Illus 66). The units are separated by a clear undulating boundary. The coarse fraction is composed mainly of fine to medium sand-sized and weathered quartz and feldspars, and frequent small sandstone fragments and frequent charred organics. The fine fraction comprises reddish brown amorphous organic material. Anthropogenic indicators of burning are present in the form of remnants of ash as expressed in the colour of the matrix, patches of grey ashy material associated with phytoliths, common clustered charcoal fragments and common burnt peat fragments. Unit 2 has a 45° sharp boundary with the underlying (602) and appears to have been dumped in a single episode.

Unit 3 has a diffuse boundary with Unit 2 but is significantly more organic than the underlying layer. Frequent patches of phytoliths denote ash clusters, and charcoal and burnt peat fragments are common to few. The distribution and orientation of inclusions and minerals is generally random although c 30% of coarser minerals are dipping around 45°. Unit 3 is interpreted as an accumulation of occupation debris.

The similarity between the two units and diffuse nature of the boundary indicates that the two units were derived from similar sources. In common with other analysed dumped contexts the lower part of (601) (Unit 2) appears to be a redeposited gravel which has seen the incorporation of silt, organic matter and burning debris. Unit 2 appears to be reflect a more gradual accumulation of occupation debris and is indicative that one of the sources of this context was an occupation horizon or possibly, given the relative concentration of ash, a hearth.

Synthesis of the decay horizon deposits (102), (210), (506), (517) & (601)

The highly humified nature of this horizon is reflected in the condition of the ecofact assemblages. The macroplant assemblages consist primarily of amorphous organic material with few identifiable plant

remains present, while the insect remains are poorly preserved. Only carbonised material survives well in this horizon. Nonetheless, it is clear from the insect assemblage and the micromorphological evidence that within this horizon are the *in situ* remains of deposits which have built up within buildings and that this must therefore relate to the footprints of the structures underneath. Nowhere is this most clear as in (102) and (210), both of which lie over the footprint of ST3. The horizontal banding of herbaceous stems observed in the micromorphological evidence is probably indicative of the presence of plant litter flooring and this is confirmed by the presence of an insect fauna that must have developed in plant litter accumulating within buildings. Rush and grass caryopses in the macroplant assemblage probably indicate the type of flooring. (102) and (210) probably represent humified versions of the flooring deposits below them, (108) under (102), and (208) under (210); in other words they represent a continuation of the build-up of floor surfaces within ST3. Similarly, (601) appears to be a continuation of the build-up of alternating deposits of gravel rich in hearth debris, ie (602) & (621), and organic flooring layers, ie (609) and (622), within ST2.

(506) and (517) lie in the N quadrant. Traces of hearth debris, cooking and food processing waste were present, while the micromorphological evidence hints at the presence of very decomposed floor coverings. There is no clear evidence in this area for any structure while the insect evidence from (515) (see above) suggests a more open, natural environment, so the floor coverings here could represent dumps of waste material.

Deposits off the crannog mound

Context (225) hearth debris dumped in loch

Micromorphology: (225) is located within K08.1 ([Illus 70](#)). This context is divided into three units distinguished by the quantity of burnt material. The context as a whole contains the greatest concentration of hearth debris from all of the analysed samples with a dense concentration of charred material in the centre of the context (Unit 2). The coarse mineral component is dominated by large sub-rounded moderately sorted sand and rock fragments.

The centre of the context (Unit 2) comprises a 35 mm layer dominated by charcoal with frequent to dominant phytoliths and common to frequent burnt bone. Organic matter is limited to amorphous yellow-red organic material and patches of burnt soil or

peat fragments indicating mixed fuel of wood and peaty turves. The presence of burnt bone fragments, as well as a fragment of fired clay indicates that Unit 2 of (225) is derived from domestic hearth waste. The central hearth debris layer is overlain by a second layer of moderately sorted coarse mineral sand which may be indicative of water sorting. Frequent charcoal, burnt bone and frequent to dominant phytoliths are distributed unevenly throughout the context. Calcitic ash is present throughout the context as scattered fine ash within the matrix as well as in larger patches.

Synthesis

It is probable that (225) represents hearth debris which has been dumped beyond the boundary of the crannog either into a waterlogged environment or an environment which was subsequently flooded, thus concentrating the lighter charcoal, ash, burnt bone and burnt peat fragments into a narrow band. Subsequent flooding events are likely to have been responsible for the deposition of the overlying sands and gravels thus sealing and concentrating the hearth waste.

The macroplant assemblage

Jackaline Robertson

The matrix of the deposits

The matrix of the organic deposits was composed primarily of occupation peat, amorphous organic material, decomposing herbaceous material and modern invasive roots. The occupation peat consisted of dark brown homogeneous lumps with no obvious inclusions that did not break down during the sieving process. The amorphous organic material was distinguishable from the occupation peat because it was lighter in colour and contained decomposing plant, peat and wood fragments which were resilient enough to survive processing. This is very similar to the matrix of the deposits found on Dorman's Island crannog (Cavers *et al* 2011, 87). The decomposing herbaceous material included large quantities of what appeared to be stems, possibly from rushes, sedges and grasses. The presence of modern invasive roots in some samples reflects the degree of post-depositional aeration that these contexts would have been subject to.

Taphonomy

The anaerobic conditions of this site have provided an excellent opportunity for the recovery of plant remains which do not normally survive within the archaeobotanical record. The assemblage at Cults Loch 3 is a mixture of both charred and waterlogged plant taxa from a variety of landscapes and resources.

The taphonomic routes by which charred and waterlogged plant material enter the archaeological record are varied. Introduction of macroplants can occur as by-products of waste from food processing and cooking, inclusions within both human and animal faecal matter, building material and from plants growing in the near vicinity which were either unintentionally blown or trampled into archaeological features (Jacomet 2012, 498). In a macroplant assemblage which has been preserved by charring, the dominant components are usually hazelnut shell and cereal caryopses as these tend to be the foodstuffs which are deliberately subjected to heat prior to consumption or, in the case of nutshells, are latterly used for kindling. Other foodstuffs such as fruits, vegetables and leafy edible plants are either not deliberately exposed to heat prior to consumption or do not survive the cooking process (Bishop *et al* 2009, 79; Jacomet 2012, 500).

Charred food remains were recovered in larger numbers than waterlogged food remains. This could be because these foodstuffs, primarily cereals, had a more important dietary role but it is more probable that waterlogged foodstuffs are under-represented within the overall assemblage. The waterlogged food remains included raspberry seeds, blackberry seeds and puff balls, foodstuffs that would not have survived charring, but have expanded our knowledge of the crannog's resource base. Hazelnut shells were recovered in large numbers in both a waterlogged and charred condition. This is due to the robustness of hazelnut shell in even the most adverse conditions. The remainder of the waterlogged plant assemblage is dominated by building materials and weed taxa which again would not normally survive carbonisation.

The crannog, which is covered with fine gravelly sediment, is relatively close to the surface and coupled with periodic changes in the water table (see [Chap 1](#)) this has resulted in fluctuating anoxic conditions. Periodic wetting and drying is not conducive to the best survival of uncharred environmental evidence. Other destructive influences such as earthworm activity and modern root growth are also evident on this site. The waterlogged macroplant assemblage is small in both species diversity and quantity but preservation ranged from poor to good, because of the factors described above.

The low concentration of identifiable plant material appears to be a

consequence of these deposits experiencing periods where they dried out and subsequently become aerated which would have permitted new plants growing on the surface to establish their roots, and thus further encouraging the decay of archaeological material. This is confirmed by the large quantities of what appeared to be humic anthropogenic material coupled with invasive modern roots and seeds particularly from deposits in ST3. The presence of large quantities of unidentifiable inclusions within the assemblages does suggest that the low concentration of recognisable material recovered may have been strongly influenced by external environmental factors.

In comparing the macroplant assemblages from each structure it is clear that the food remains, in particular the cereals and hazelnut shell, were concentrated within ST1 and ST2 ([Illus 71a](#)). Amorphous organic material was present in all contexts but it was particularly prevalent in ST3. It is possible that ST1 and ST2 were primarily used for domestic habitation while ST3 was employed for another purpose which did not involve food storage or cooking, but the differences between ST3 and the other structures is more probably due to the increased degree of organic decay that ST3 has suffered.

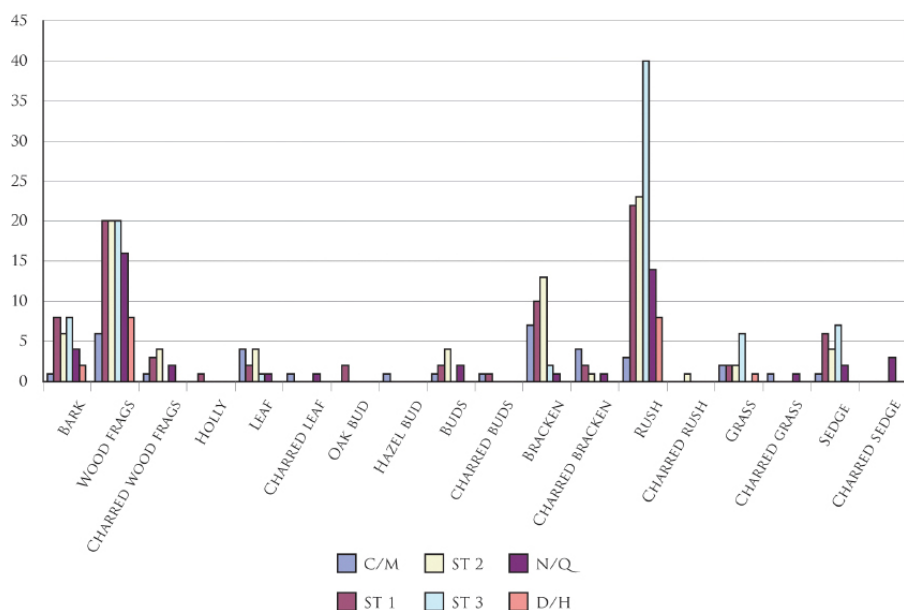
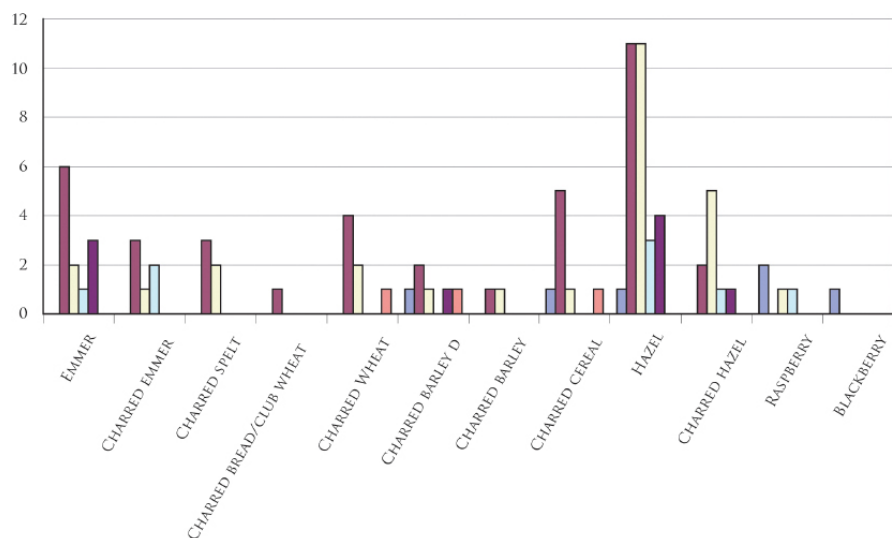
Cereal remains

The edible plant remains were dominated by charred cereal caryopses of emmer, spelt, wheat, barley and some bread/ club wheat. A relatively high concentration of emmer chaff fragments were recovered from the occupation contexts, in particular (520) and (634) in ST1 ([Illus 71a](#)). This suggests that cereal was transported to the site while still attached to the ear for storage and processed directly on the crannog. The cereal chaff fragments could be representative of material used for thatching, but no straw nodes were observed so it is more likely this material is processing waste. The waterlogged chaff was often recovered from the same occupation deposits in which charred cereal caryopses were found but they represent different taphonomic routes. The charred cereal caryopses must represent cooking waste while the waterlogged chaff was probably trampled into the occupation deposit after it was dislodged from the cereal caryopses.

Although the cereal assemblage is relatively small some conclusions concerning the economy, diet and status of the crannog can be drawn. Emmer and barley probably formed a mainstay of the diet of the crannog population. In general hulled six row barley is the dominant cereal crop found on most Iron Age sites with emmer as a minor component (Boardman 1994, 270). This was certainly the case at the

Iron Age settlement at Carronbridge (ibid) but amongst the few other contemporary sites which have been excavated in SW Scotland and which have produced macroplant assemblages, the picture is more varied. Barley was the only cereal present in the Iron Age enclosure at Woodend Farm, Johnstonbridge (Alldritt 2000, 250), but at the enclosure at Uppercleuch, Annandale the most abundant cereal remains were emmer with only small amounts of barley (Terry 1993, 66). At Rispain Camp bread wheat appears to have been more abundant than barley in some pre-Roman Iron Age contexts (Haggarty & Haggarty 1983, 37, 39).

A single caryopsis of bread/club wheat was recovered from (634). Finds of bread/club wheat are generally rare on later prehistoric sites in Scotland; apart from the unquantified assemblage from Rispain Camp the only other find was a single grain from pre-Roman Iron Age deposits at Fox Plantation, near Luce Bay (Alldritt 2000, 40). Alldritt (ibid) has argued that its presence at Fox Plantation is exotic and that it may represent a commodity traded with Roman sources. Bread/club wheat is more commonly found on Roman sites where it is thought to have been imported from elsewhere in the Roman empire rather than being locally grown (van der Veen 1992, 154– 155; Boardman 1994, 270). The single glume base found on Dorman's Island crannog could arguably be as a result of contact with Roman sources (Cavers *et al* 2011, 87) but the grains of bread/club wheat recovered on the crannog, and also from Roundhouse A at Cults Loch 5 ([Chap 4](#)) and in postholes within Cults Loch 4 ([Chapter 3](#)) could reflect earlier trading contacts with southern Britain.



Illus 71. a. edible plants by structure and context; b. flooring material by structure and context. Key: C/M = crannog mound; ST1 = Structure 1; ST2 = Structure 2; ST3 = Structure 3; N/Q = N quadrant; DH = decay horizo

The presence of spelt on later prehistoric sites has also been seen as indicative of trading links. Until the SWAP programme in SW Scotland it had been recorded at only one other pre-Roman site in Scotland, the crannog at Oakbank, Loch Tay (Miller 2002, 43). Miller argued that at Oakbank spelt was either a traded or tribute item, or that it had been grown on a very small local scale when mild conditions allowed. Spelt has now been found in small amounts on Dorman's Island crannog

(Cavers *et al* 2011, 87), in Roundhouse A at Cults Loch 5 ([Chap 4](#)) and in postholes within Cults Loch 4 ([Chap 3](#)). Growing conditions around Cults Loch were probably more amenable than around Loch Tay so the spelt here could represent a minor crop. However, even at Roman Carronbridge, Boardman (1994, 270) thought that the possible spelt found there probably represented an import.

Wild food resources

The inhabitants of the site also exploited seasonal wild food resources such as hazelnuts, raspberry and blackberry ([Illus 71a](#)). Fragments of puffball were recovered from deposits in ST1. This species is edible and may have been collected as a foodstuff. However, there were no other food residues in these two deposits, apart from a small quantity of hazelnut shell, so they may have been incorporated incidentally. They could have been transported onto the site along with woodland materials collected for fuel and construction.

Hazelnut shells are among the most common finds from Iron Age sites due in part to their easy availability, their high nutritional content and the ability of the shell to survive within the archaeological record even in the poorest environmental conditions (Johnston *et al* 2007). At Cults Loch waterlogged hazelnut shells were concentrated in occupation layers and hearth deposits in ST1 and ST2. The same deposits also yielded charred hazelnut shells but in smaller numbers. This indicates that the hazelnut shells are primarily representative of food residue with some of these shells either deliberately charred after the nut was extracted or burnt accidentally and then trampled into the floor deposits along with the uncharred shells.

Raspberry seeds were found in two floor surfaces, (108) and (604), and both raspberry and blackberry seeds were found in Core 5.2. The presence of fruit seeds has been taken to identify the dumping of cess waste at other crannogs (Johnston & Reilly 2007, 56) but there was no other evidence to indicate that human waste was incorporated in any of these deposits. While this could be as a result of poor survival (raspberry and blackberry seeds are hardy and would be able to survive periodic drying and bioturbation by invasive roots and insects whereas more fragile organic evidence such as cess is more likely to decompose), it seems more likely that human and animal waste would have been disposed of into the loch.

Building materials

The bulk of the plant remains represents materials brought onto the

crannog for building. Wood fragments were ubiquitous, as was bark (Illus 71b). Undressed logs were used to build the foundation of the crannog, for sub-floor structures and for stakes (see Chap 2e) and this would have been the source of much of the woody debris found in the macroplant assemblage. Bark was present in 46% of the analysed contexts and was particularly prevalent in the floor layer (609), so it is possible that stripped bark was deliberately used to build up floor layers. Similar quantities were found in (522), a deposit of hearth debris in which burnt and unburnt flooring materials were found.

There is a suite of plants on the crannog which was present in all three structures and particularly in the laminar deposits identified as floor coverings (Illus 71b). Bracken, rushes, sedges and grasses occur together in varying quantities in floor coverings (108), (521), (622), (633), 634) and (635), so where they occur in other deposits it has been assumed that this is also representative of the presence of floor coverings, either *in situ* or discarded. Bracken would have had to be brought onto the site, either accidentally or deliberately, but the rushes and sedges would have been growing around the silty margins of the crannog and the loch and so it is feasible that some of the seeds and nutlets could have been blown or trampled into the deposits. However, they are so abundant in many of the deposits that the assumption that they represent flooring is reasonable. Leaves, including some which were recognisably those of holly, were also present in some of the floor coverings.

The bracken occurs as recognisable plant components, ie stems and fronds, but the rushes are represented by seeds and capsules, the sedges by nutlets, and grasses by caryopses. However, herbaceous plant stems which were not identifiable to species were common in many of the floor coverings and it is assumed, because of the quantities of identifiable components of those species present, that these were rush and sedge. These plants have traditionally been used to line floor surfaces, especially when bracken was unavailable or difficult to source during the winter (Johnston *et al* 2007).

The charred remains of this suite of plants have been found in numerous deposits, particularly those which contain hearth debris, ie (515), (516), (606) and (620). It is unlikely that these plants would have deliberately collected for fuel so it is assumed that dirty, discarded floor coverings were burnt on the hearths.

Small quantities of mosses were present in almost every analysed sample. Certain species of moss can be used for making rope, toilet paper and antiseptic bandages, and as packaging and fuel (McMullen 2000) but there is no evidence at Cults Loch to suggest that any of the

mosses had been used in such a way. Only a single charred stem fragment was recovered, for instance. Many of the mosses probably arrived on the crannog as accidental inclusions attached to timber and turves (see below). However, mosses are abundant in many of the floor coverings, ie (209), (212), (521), (633) and (634), so they may have been used deliberately in these contexts to provide insulation.

Fuel

Apart from the carbonised wood in (513) which has been interpreted as the burnt remains of a hurdle panel, all the charcoal found on the crannog represents fuel debris. Hazel, oak, alder, willow and birch were burnt, but hazel roundwood was the most important wood fuel, accounting for 47% of the assemblage (see [Chap 2e](#) for more detailed discussion).

Small quantities of burnt peat were recovered from many deposits containing hearth debris, as well as floor layers. This suggests that peat was deliberately collected for use as fuel, probably in the form of turves. Loose sphagnum leaves were often present in those samples containing either peat or burnt peat so this moss probably arrived on the site attached to the turves.

The weed assemblage

The weed assemblage was relatively restricted in both quantity and diversity. Weed taxa were recovered from every deposit and were spread throughout the site with no obvious concentrations suggestive of deliberate disposal. The weed taxa represented are typically associated with agricultural land, damp and disturbed, or waste ground, and moor/heathland habitats. The limited number of identifiable weed taxa and variety of species recovered from Cults Loch may be because deposits on the crannog built up rapidly and surfaces were constantly replenished so that there were few opportunities for weeds to successfully establish themselves. Most weed taxa were probably simply trampled into the floor surfaces during occupation but there are some instances where the weeds may have been able to colonise a surface during a period of abandonment, as has been suggested for some of the floor layers in ST2, (609) and (622).

Fat hen, a common annual weed species closely associated with cereal crops or with human occupation, was by far the most abundant species present and was extremely well preserved; it was common to find over $10\times$ as many seeds of this taxa in a context in comparison to the other weed taxa present. The leaves and seeds of many

goosefoot species are edible and have been deliberately gathered to supplement both human and animal diets, especially during times of food shortages (Johnston *et al* 2007). However, there was no evidence to suggest that it had been deliberately collected. Furthermore, the abundance and quality of preservation of the fat hen seeds, particularly those recovered from ST3 where organic decay was quite advanced, raises the possibility that at least some of the fat hen may represent modern contamination. This was very apparent when comparing the three core samples from the deposits under the crannog with the bulk samples from the upper deposits; there was little modern invasive material, in the form of roots in the core samples, and much smaller amounts of fat hen.

During the 2009 excavation season, when flooding was a particular concern, it was noted that the samples taken during that season contained relatively high concentrations of fresh, modern looking seeds. We postulated that modern material growing on the surface of the crannog and around the loch shore might be blowing in, brought in by the rising waters or on the excavators' shoes and clothes. To test this, water samples were taken during the 2010 excavation over a period of ten days from the water which flooded the crannog overnight. From these small quantities of modern plant material including fat hen and birch seeds and were all found in the flood waters in the newly excavated area. We conclude that at least some of the fat hen in the bulk samples might therefore represent modern contamination.

Conclusion

The macroplant assemblage from Cults Loch crannog contained both charred and waterlogged food residues, fuels, building materials and weed taxa, much of it indicative of domestic activities. The inhabitants exploited a variety of landscapes including the environs of the loch, woodlands and heathland. They cultivated a range of cereals and collected wild foodstuffs. While the emmer and barley were probably cultivated locally the spelt and bread/club wheat may represent exotic imports. These two species could have been cultivated locally but it seems more probable that they were traded from further afield. Food residues are present on the crannog in relatively small quantities which suggests that floors were cleaned regularly and middens were not allowed to build up on the crannog. Instead this waste would probably have been regularly disposed of into the loch. The limited concentrations and range of weed taxa indicates that floor layers were probably rapidly constructed; greater concentrations of

weed taxa in some deposits, in combination with other circumstantial evidence, is suggestive of abandonment and subsequent colonisation by weed species.

Small macroplant assemblages have been retrieved from the crannogs at Dorman's Island (Cavers *et al* 2011, 87–89) and Loch Arthur (Henderson & Cavers 2011, 115–117). At both emmer was the dominant cereal, with some barley and spelt and a single bread/club wheat glume base at Dorman's Island. A more comprehensive macroplant assemblage was retrieved from Oakbank crannog (Miller *et al* 1998; Miller 2002) which is in many ways comparable to that from Cults Loch. Large quantities of bracken were found, together with rushes and a variety of mosses, all of which could have been used for thatching, flooring and wall insulations (Miller 2002, 40–42). Barley was the dominant cultivar but emmer and spelt were also found and it has been suggested that these may have been traded rather than grown locally (Miller *et al* 1998). Oakbank differs from Cults Loch in that other exotics were found; cloudberry pips imply transhumance or long-range hunting in high altitudes, while the opium poppy seeds may also signify trading contacts. Selfheal has been found in small amounts in two contexts from Cults Loch but it was found in such quantities at Oakbank that Miller (2002, 41) suggested that it was deliberately collected for its medicinal properties.

The crannog has undergone periodic drying which has allowed modern vegetation to establish their roots within the archaeological deposits. This is evidenced by the large concentrations of decomposing humic matter within the assemblage. Consequently, some modern material, such as the well-preserved fat hen seeds discussed above, may have become incorporated into the archaeological deposits. Those samples closer to the surface have experienced the most in terms of aeration by the colonisation of modern plants on the surface, particularly those contexts from ST3.

Insect remains

Enid Allison

Living conditions on the crannog

Beetles and bugs were common or abundant in all of the samples and most assemblages were dominated by taxa associated with decomposing material in general, and settlement waste in particular. The range of decomposer beetles was very consistent from sample to

sample and their diversity was low which is often indicative of breeding populations. Other possible implications of low decomposer diversity are discussed further below.

A distinctive suite of insects typical of mouldering plant litter within buildings was represented in all of the samples, most abundantly in (635) which was thought to represent floor coverings in ST2. Human fleas (*Pulex irritans*) were specifically identified from six samples and indeterminate flea body segments in several others were likely to be from the same species. Human fleas are primarily associated with human habitation and can be associated with litter from buildings occupied either by man or domestic animals. In Britain and Ireland 20% of human flea records are from domestic animals, especially dogs, cats and pigs (George 2008, 14). Smit (1957) noted that they sometimes occur in large numbers in pig sties. The close similarities between insect assemblages from deposits identified as flooring and those relating to other parts of the crannog suggest that dumping of debris from within buildings occurred in peripheral areas and probably in earlier deposits associated with its foundations. It is also possible that some deposits incorporated less recognisable floor remnants.

A single sample from a deposit packed around the sides of a timber box that formed part of Hearth 2 in ST2 ((616)) was quite different in composition and contained an insect assemblage indicative of naturally accumulated peat or turf from heathland. Bugs and beetles associated with heathers (*Calluna* and *Erica*) were especially well represented. Some insects recorded in small numbers in the rest of the samples were common in this deposit suggesting that many of the 'outdoor' insects recorded from man-made litter accumulations were probably more likely to have been introduced with peat or turves, rather than having arrived by their own volition, in 'background' fauna. Burnt peat was frequently observed in micromorphology samples and plant macrofossil assemblages, indicating that peat was an important fuel used on the crannog. Turves from other types of land may have been used structurally or as lowgrade fuel.

Half of the samples examined for insects were from deposits thought to represent flooring and these may have incorporated insects from roofing and walling materials as well as floor litter per se. The nature of the walls and roofs of the structures was unclear from the excavated evidence but they may have been at least partially composed of coarse plant material or turves. The insect remains from the floor deposits contribute considerably towards a picture of domestic life on the crannog. The building fauna recorded in all the samples suggests fairly

dry conditions and a reasonable level of comfort for much of the time. However, some of the commoner generalist decomposers, such as *Cercyon analis*, *Carpelimus bilineatus* agg., *Ptenidium*, and *Cordalia obscura*, are indicative of rather soft, moist decomposing material, and several floor samples contained a few taxa indicative of very foul matter (mainly *Cercyon unipunctatus* and *C. terminatus*). Such conditions could have developed below the floor surface, probably at least partly in response to increasing dampness caused by adverse weather, subsidence or rising water levels in the loch. This may have instigated the regular laying of a new drier upper layer of litter, perhaps retaining some of the fouler material below. Fly puparia, especially of house flies (*Musca domestica*), were present or common in most deposits. They were notably abundant in a laminated litter layer (510) in ST3, and were obvious enough to be noted in the deposit description for a primary floor surface (633) within ST1. House flies lay their eggs in foul nutrient-rich organic substrates associated with human habitation and activities. They are attracted to faeces of man and animals and other accumulations of organic waste from daily life and craft activities that provide suitable pabula. At the Coppergate site in York, analysis revealed that house fly puparia were largely confined to surface deposits, presumably where foul organic matter was present (Kenward & Hall 1995, 677). If this observation holds true for elsewhere, floor surfaces at Cults Loch are likely to have sometimes become very moist and foul, not only the deeper layers of litter. Adult house flies were almost certainly the most commonly noticed insects on the crannog, not only causing irritation and annoyance but also having the potential to transmit various pathogens.

Two species of biting lice (Mallophaga: Trichodectidae) were recovered from floor deposit (635). *Bovicola caprae* and *B. ovis* are found on goats and sheep respectively and they appear to be generally confined to their specific hosts (Séguy 1944). Cross infestations have been recorded but it is thought that they are unlikely to be of common occurrence (Hallam 1985; O'Callaghan *et al* 1988). *B. ovis* often occurs in archaeological insect assemblages in contexts where they appear to be derived from the cleaning or processing of fleeces or wool rather than the penning or close proximity of sheep. They are particularly recorded from house floors or from redeposited floor litter (for example in Anglo-Scandinavian tenements at Coppergate in York (Kenward & Hall 1995, 775–777). They were present in the fill of a drain or conduit beneath a room in an Icelandic farmstead, where they had perhaps accumulated as a result of washing fleece or wool (Buckland & Perry 1989). The second louse species *Bovicola caprae*

may have been brought into the structure on untreated goat skins. At an Early Christian period rath excavated at Deer Park Farms in Antrim, Northern Ireland, *B. caprae* was recorded in considerable numbers and from so many deposits that it was considered likely that goats were kept on the rath (Kenward & Allison 1994; Kenward *et al* 2011). At Cults Loch four individuals of *B. caprae* were recorded from floor (635), and foul decomposers that might be attracted to dung were less well represented than in most other deposits, making it unlikely that goats were kept within this particular structure during the period represented. The plant macrofossils from the same deposit did not provide any evidence of animal fodder or stable waste. Roy (below) remarks upon the marked general absence of faecal spherulites and excremental fabrics in micromorphological samples from the crannog, and considered that there were no indications that any of the occupation deposits studied represented animal stabling. Floor (635) was the only deposit where lice were recovered but the moderate to poor preservational conditions in other deposits may have precluded the survival of such delicate remains.

Whether animals were kept on the crannog or not, many of the insects recorded from floor layers imply that conditions within the structures may have resembled a stable in some respects. Not only were breeding house flies often abundant, but a range of beetles typical of moist open-textured nutrient-rich decomposing organic material such as *Oxytelus sculptus* and *Leptacinus* species were common. These, along with a building fauna, are among several groups of insects proposed as indicators for stable manure by Kenward and Hall (1997). *O. sculptus* was particularly common in a sample from the matrix among hazel brushwood (212) laid down over horizontal timbers (218) in ST3, and in the amorphous organic matrix (515) around basal timber work (526) in the N quadrant. The archaeology suggested that both these deposits were connected with ground raising or consolidation of the mound, and it is likely that both these deposits represent discarded floor litter used for this purpose, perhaps after an initial period of midden accumulation. Other groups of insects thought to be characteristic of stable manure by Kenward and Hall are pests of grain or stored fodder, and insects from hay (particularly a range of grassland weevils, including unemerged specimens). Neither of these groups were identified here, although grain pests would not be expected in an Iron Age deposit. They are commonly recorded from the Roman period in Britain from the earlier stages of occupation onwards, but do not occur in pre-Roman deposits (Buckland 1978; Smith & Kenward 2011).

Comparison of decomposer assemblages from Cults Loch 3 and Buiston crannog

In any comparison between the insect assemblages from Cults Loch 3 and the later crannog at Buiston it should be noted that a greater number of samples were examined for insect remains from the latter (38 samples from four phases of activity), including some that contained low concentrations of remains. At Cults Loch 3 the 14 samples analysed for insects were selected on the basis of whether remains were obvious during assessment of plant macrofossils, in effect pre-selecting deposits where insect remains were most abundant.

Insects typically associated with ancient buildings and consistently represented at Cults Loch were *Latridius minutus* group, *Cryptophagus* spp. (including *C. scutellatus*), *Atomaria* spp., and less commonly *Xylodromus concinnus* and *Cratarea suturalis*. Of these, *Cryptophagus scutellatus* and *Cratarea suturalis* are particularly characteristic of artificial habitats. Other common decomposers with less specialised feeding habits were *Gyrohypnus fracticornis*, *Acrotrichis*, *Ptenidium*, *Cordalia obscura*, *Oxytelus sculptus*, *Carpelimus bilineatus* and *Cercyon analis*, the last two usually being particularly numerous. None of the beetles recorded were in themselves strongly synanthropic (ie tied closely to man and his activities and rare in nature), but human fleas and house flies both fall into this category. Some of the commoner beetle taxa are regarded as facultative synanthropes, found in naturally occurring decomposing matter but favoured by intensive human activity which can provide longer-lived habitats, and where large populations of certain species may opportunistically develop. Decomposer diversity (α RT) was rather low at Cults Loch with a mean value of 12 for 14 assemblages. This figure is a little greater than at the later crannog at Buiston where the mean value of α RT for 23 assemblages was only 9.

The decomposer fauna at Buiston was regarded by Kenward *et al* (2000) as impoverished by comparison with northern English sites of a broadly similar date (for example, Roman deposits in Carlisle (Allison *et al* 1991a; 1991b) and York (Hall & Kenward 1990)). The mean value for diversity of the decomposer component was compared with values obtained from Early Christian assemblages at Deer Park Farms in Antrim, Northern Ireland (Kenward *et al* 2011) and Anglo-Scandinavian deposits at 16–22 Coppergate in York (Kenward & Hall 1995). Sixty-two assemblages at Deer Park Farms and 419 assemblages at Coppergate both had mean values for decomposer diversity of 25, considerably greater than either Cults Loch or Buiston,

although some species regularly found on English sites were absent from Deer Park Farms. The comparison of Deer Park Farms with Buiston was considered to be particularly appropriate since it was a relatively isolated rural site and broadly comparable in terms of climate and geography. The high diversity of the decomposers at Deer Park Farms is thought to be the product of continuous intensive occupation over a very long period, perhaps over centuries. Kenward *et al* (2000) suggested that, in contrast, settlement at Buiston may have been less intensive and less longstanding, or that occupation was intermittent or seasonal. Ancient structures need not necessarily have been occupied to accrue or maintain some elements of a building fauna. Work by Smith (1996) suggests that some synanthropic beetles may persist for decades following abandonment of a site. Also, some beetles characteristic of ancient buildings were recorded from modern unoccupied reconstructions of Saxon buildings at West Stow (Kenward & Tipper 2008). The relative isolation of Buiston from areas of Roman occupation and influence may also have played a part in the absence of some beetles; indeed it was pointed out that at least some deposits may have accumulated prior to the introduction of grain pests. Another factor that may generally have affected decomposer diversity on crannogs may have been habitat restriction. The ease with which occupation refuse could be dumped into the surrounding water, for example, would make the creation of refuse pits and middens adjacent to living quarters largely unnecessary. Such features can support considerable communities of decomposers.

While occupation at Cults Loch may well have been less intensive than at Deer Park Farms and Coppergate, and at a similar, or perhaps slightly greater level to that seen at Buiston, the evidence is equivocal because of the date of the site and the paucity of comparable data. The crannog at Cults Loch is thought to have been constructed and occupied during the mid- to later 1st millennium BC, and some impoverishment of its associated decomposer insect fauna would be expected relative to later historic period sites. Most beetles regarded as strong synanthropes are recorded only from the Roman period onwards in Britain. Several species associated with dung and hay, and others typical of human habitation sites also appear in the fossil record during Roman times (Buckland 1996, 169; Kenward 2009, 229). Some beetles, notably the major pests of grain, appear to have been imported with commodities, while others simply have poor dispersal abilities and probably require long-lived settlement and sustained contact between occupation sites to gain a foothold. *Ptinus fur*, a spider beetle often associated with human occupation and

recorded from some prehistoric sites (eg Osborne 1969), was absent from both Cults Loch and Buiston. The absence of taxa such as *Tipnus unicolor* (another spider beetle) and *Aglenus brunneus*, both with poor dispersal abilities and good indicators for stable, long-term occupation, is not unexpected in prehistoric deposits at Cults Loch, and neither was recorded from Buiston. *A. brunneus* is not completely confined to the historic period – it has been recorded from pre-Roman deposits in Oxfordshire (Lambrick & Robinson 1979). On the other hand, species such as *Cryptopleurum minutum* and *Xylodromus concinnus* which have sometimes been suggested as possible Roman introductions were both recorded from the present site. They are also known from Iron Age deposits at Goldcliff (Smith *et al* 1997; 2000) and *C. minutum* has recently been recorded from a Bronze Age deposit on Shetland (Allison 2012).

Much remains to be learned about how insects become adapted to anthropogenic environments (Elias 1994, 116) and the rate of arrival of synanthropes at relatively isolated sites is still a matter for speculation (Kenward 1997; 2009, 229). Insect communities from waterlogged occupation deposits excavated on other crannogs of various dates and with varying degrees of isolation may well provide a key to a closer understanding of the development of the synanthropic beetle fauna.

The terrestrial environment in the vicinity of Cults Loch

Insects from natural habitats can often provide good information on local aquatic and terrestrial habitats, but for this site environmental reconstruction was hampered by the obvious presence of imported materials. Even so, it is likely that vegetation used in floor litter and peat or turves were cut reasonably locally. The range of insects recorded implies that material was imported from both drier and damper localities. It was striking that a majority of the ‘outdoor’ insects recorded from occupation deposits were associated in some way with peat, turf, or grassland generally. Heathland turf or peat was specifically identified from one sample, but it is possible that other types of turf were also collected for burning or structural use.

Remains of the chafer *Phyllopertha horticola* were present or common in 11 of the 14 samples (represented by 1 to 9 individuals in the various deposits). The numbers represented imply that it was correspondingly abundant in the hinterland of Cults Loch, and it may have been frequently imported in turves or cut vegetation such as hay (Kenward 2009, 292). The beetle, known colloquially as the ‘June bug’, is likely to have been an obvious element (given its size) in the

early summer insect fauna of the area. It is characteristic of poor quality permanent grassland on light soils, where there is a diversity of flowering plants and a high proportion of weeds. Their larvae feed on the roots of turf and can be remarkably abundant in some areas, sometimes reaching concentrations of 2,500,000/ hectare. The adults emerge suddenly in May or June and are active for 3 to 4 weeks, flying only in warm sunny weather (Raw 1951). Another small chafer *Serica brunnea* recorded from four samples is found in similar grassland habitats and also has turf-dwelling larvae.

Geotrupes sensu latu and a number of *Aphodius* species were represented in many of the samples. These beetles are primarily associated with herbivore dung but some *Aphodius* will, less commonly, also exploit decaying plant matter including foul habitation waste, and some hibernate in flood refuse (Jessop 1986, 20–25). *A. contaminatus* was recorded from a majority of the samples since it is rather distinctive and reasonably easy to identify from fragmentary material. It occurs in the dung of various domestic animals in the autumn months (Jessop 1986, 23), and is usually typical of dung deposited in the open, as is *A. rufipes* which was identified from one sample. Other *Aphodius* remains were too fragmentary or otherwise poorly preserved to be closely identified. The general abundance of dung beetles in all of the assemblages, including that from the imported natural peat/turf (616), suggests that grazing animals were probably a common presence on the mainland locally. Dung beetles have excellent dispersal abilities and they probably formed a significant part of the background fauna of the area, with some species attracted to foul habitation waste.

Wood-related taxa

In some samples there were a few slight hints of local trees and scrubland from taxa such as the planthopper *Oncopsis* and the click beetle *Denticollis linearis*, but generally tree- and wood-related taxa were poorly represented. Small numbers of several *Anobium* species were recorded from some deposits. *A. punctatum* (the common woodworm beetle) which infests structural timber as well as dead wood in natural situations was definitely identified in two instances, and *A. fulvicorne* which is associated with wood of various trees, especially oak, and *A. inexpectatum* which appears to be found exclusively on ivy were recorded from one sample. These three taxa may have been imported onto the site with wood, but it is also possible that ivy grew on the crannog. The rarity of taxa associated with dead wood seems surprising in view of the amounts of timber

and brushwood that were used in the crannog structure. This rarity was also noted at Buiston, where it was suggested either that dead wood habitats may have been generally uncommon in the locality, or perhaps that fresh timber was imported for structural purposes and dead dry wood used less frequently as fuel than peat or turves (Kenward *et al* 2000). A further possibility may be that timber was used mainly in the wetter basal parts of the crannog, with much of the superstructure perhaps being constructed of other material such as turves or cut vegetation. Wood-boring insects and their larvae would not be able to survive in waterlogged wood.

Aquatic conditions

A limited range of water beetles and bugs made up a relatively small proportion of the insects from Cults Loch (up to 11% of the whole assemblages in all but one sample). Values of this order are likely to chiefly reflect the position of the site on the edge of the loch, with some aquatic insects becoming incorporated into various deposits making up the crannog during times of high water or following subsidence. The almost ubiquitous presence of statoblasts of *Cristatella mucedo* and ?*Plumatella* (in all but two samples) probably also relate to inundation, but at least some of these in particular may not be contemporaneous with occupation of the crannog. Aquatic beetles and bugs were somewhat better represented in (622), a deposit interpreted as a build-up of floor coverings (18% of the total). The proportion was elevated mainly due to the presence of fragments of an estimated ten water boatmen (Corixidae) while water beetles were no better represented than in other samples. The raised proportion of this group was suggestive of somewhat more aquatic conditions than in other deposits, either because of inundation or the deliberate re-deposition of waterlain deposits in the floor layer. The evidence was equivocal however, since water boatmen are very capable fliers and would have been a common element in the lochside aerial insect fauna. Occasional nymphs of water boatmen which cannot fly were noted in the same sample but if the deposit had been submerged for an extended period, a greater range of water beetles might be expected. The proportion of aquatics in context (622), although elevated by the standards of other samples examined, was considerably lower than in some deposits at Buiston crannog where they accounted for 36–53% of the assemblages, providing convincing evidence for aquatic deposition or the use of dredged sediment to raise the crannog mound (Kenward *et al* 2000). It should be noted that the samples from Cults Loch were from a more restricted range of deposits than at Buiston.

The restricted range of aquatic beetles and bugs recorded from Cultra Loch provided correspondingly limited data on local water conditions. *Oulimnius* (a riffle beetle: Elmidae) was consistently the most numerous water beetle, and the various species within the genus require well-oxygenated, clear, silt-free conditions for their survival. They are found predominantly in running water, but also can occur on stony lake shores (Holland 1972). Their abundance here suggests a further possibility that they may have colonised submerged coarse woody debris making up the crannog structure. Water lapping against such material may have provided suitably oxygenated conditions for their survival. Few other taxa were identified closely enough to provide details of aquatic habitats, although *Hydraena nigrita* (recorded from one sample) is found among gravel and stones in flowing water, often in shaded locations, while *H. testacea* (found in several samples) is usually found in muddy stagnant water (Friday 1988, 149). Other than a few eurytopic taxa, most other aquatic beetles were not closely identifiable. A number of waterside taxa, such as *Cercyon ustulatus*, *Chaetarthria* and *Dryops*, suggested that there may have been wet mud in at least some places on the crannog.

Micromorphology

Lynne Roy

Comparanda

With the exception of recent work at Dorman's Island crannog (Cavers *et al* 2011), micromorphological analysis of crannog floor surface material is relatively scarce limiting direct comparisons. However, comparisons can still be made with micromorphological studies of lake dwellings (Lewis 2007), experimental micromorphological studies of floor deposits from across Europe and with experimental floor surfaces from Butser Ancient Farm (Macphail *et al* 2004) and Thvera (Milek 2010).

The concentration of burnt material in an open water context as observed in (225) is analogous to deposits observed during micromorphological studies at Lake Luokesas in Lithuania (Lewis 2007). Micromorphological analysis of samples from lake dwellings there revealed a concentration of burning residues at one site and three phases of charcoal deposition at another. Having originally being deposited in open water the sediment was subject to the onset of lake regression and peat formation which had significantly altered the archaeological and micromorphological record (Lewis 2007 cited

French 2013, 562). As discussed above, it is likely that the concentration of burning residues noted within (225) is a product of post-depositional fluctuation in water levels which has concentrated burnt material outwith the occupation zone of the crannog.

The heterogeneity of the mineral floor surfaces observed within the Cults Loch samples is typical of flooring deposits found across Europe as they incorporate burnt peat, ashes and charcoal derived from local hearths, eg (513) with soil excrement and earthworm granules trampled in from outside the structures (Goldberg & Macphail 2006). The groundmass is dominantly heterogeneous which would be expected for floor deposits (Goldberg & Macphail 2010).

The banded nature of the floor surface deposits is also typical of those found elsewhere and there are many examples of archaeological floors being covered by plant 'matting' giving rise to compact floor deposits associated with planar voids, articulated phytoliths and iron staining (see Cammas 1994; Goldberg & Macphail 2006, Macphail *et al* 1997; Matthews *et al* 1997). The dipping nature of the mineral grains combined with the limited concentration and range of weed taxa identified in the macroplant assemblage indicates that in general the floor surfaces accumulated relatively rapidly, ie they are likely to represent continued occupation and accumulation of material as opposed to periodic abandonment and subsequent reoccupation. Nonetheless, there are surfaces such as (609) which were exposed for sufficient time to allow soil mixing, and indicate possible abandonment of the structure.

The difference noted between relatively clean mineral floor deposits such as (212) and the more heterogeneous organo-mineral deposits such as (207) may represent the difference between intentionally deposited ground-raising gravel and beaten/ trampled material which more likely represents the accumulation of general occupation debris. The deposition of each plant matting and gravel layer is likely to mark the renewal of a clean living surface in a similar process to that noted by Matthews *et al* (1996) but in a wetter and as such significantly less clean environment.

Analysis of floor surfaces at Dorman's Island crannog showed evidence for the addition of wood and bark which was subsequently trampled and interpreted as evidence of attempts to raise the floor level of the crannog, although at Dorman's Island the probable addition of clay was also identified, a process not evident in the thin sections from Cults Loch. The sub-angular blocky structure of the soil identified at Dorman's Island crannog was interpreted as indicative of subsequent wetting and drying. The presence of polyconcave voids

within some samples from Cults Loch suggests some soil collapse related to trampling and possibly also to water saturation, a characteristic that fits with a deposit that has seen at least some wet-dry cycles and displays similarities to characteristics observed in samples from Dorman's Island crannog (Cavers *et al* 2011).

Stabling deposits from Early Medieval London Guildhall (Macphail & Goldberg 2006, 245) and Butser Ancient Farm (Macphail *et al* 2004) were found to be highly organic with fragments of layered plant material not unlike the horizontally lain plant tissue observed in the Cults Loch samples. Whilst the faecal spherulites which help to characterise such layers (Goldberg & Macphail 2010) were not observed, anthropological research into the micromorphology of known stabling deposits has shown that faecal spherulites are not always present (Milek 2010, 130). Indeed it is probable that in such a highly organic deposit calcitic faecal spherulites did not survive. However the location of the humified bands both overlying and underlying trampled mineral occupation deposits gives these layers a heterogeneity more typical of beaten floor deposits. The interpretation of the humified organic bands as a series of intentionally deposited vegetation matting is the most likely explanation for all but (616) which appears to be redeposited natural peat.

Deposit formation

Mineralogy of the sand grains and lithology of the rock fragments from throughout the sample sequence represent a soil parent material (gravels and sands derived from greywackes (Bown *et al* 1982)) present over much of the surrounding area. Rock fragments are predominantly sandstones and most are classified as lithic greywackes (see Mackenzie & Adams 1994, 109).

It should be noted that the series of occupation deposits recorded at Cults Loch present a far from complete picture of the occupation sequences as they were originally deposited. Whilst post-depositional reworking by flora and fauna has been limited, thus allowing for the preservation of pedofeatures across the samples, it is clear that perhaps the more significant forces of post-depositional flooding and erosion have removed and redeposited significant quantities of sediment, a process that will have affected the site at macro-scale as well as the micromorphological traces that are evident. The destruction of relict soil features is often a problem for sites affected by fluctuating groundwater tables and saturation almost always leads to some alteration of the sediment record (French 2013). Pedofeatures indicative of fluctuating water levels are common throughout almost

all of the samples and include the occurrence of abundant iron hydroxide (hypo-/quasi) (Vepraskas *et al* 1994) reflecting the prevailing wet conditions across the site. Dusty clay coatings/ partial infilling to voids and inwashed fine organic matter within the groundmass occur in just over half of the analysed contexts.

What must also be borne in mind is that if the floor deposit contexts do indeed represent attempts to clean and then cover the floor it is probable that much of the original 'dirty' floor surface, which would be expected to contain a very heterogeneous mineral mix of anthropic deposits, such as those of (502) (see below), was removed and dumped or swept elsewhere. Thus the majority of the occupation debris that would have accumulated during day to day activity is likely to have been removed (Macphail & Goldberg 2010).

In addition to the probable natural removal and truncation of deposits, the identification of redeposited occupation material and hearth waste indicates a process of deliberate removal of deposits during occupation. Sharp boundaries between compacted organic layers and gravel layers were noted on site and micromorphological analysis has identified sharp boundaries between (108) and (102), (211) and (212) which may represent the removal of 'dirty' occupation material that had accumulated on and/or within vegetation mats prior to the deposition of a 'cleaner' gravel floor surface. The dumps of occupation material found across the site attest to the moving of significant quantities of occupation debris. It is thus probable that the periodic resurfacing of floor deposits with vegetation matting and gravel in an attempt to clear and/or raise the floor surface also involved the periodic removal and dumping of occupation debris. This is a process that has been identified during detailed studies at Catalhoyuk (Shillito *et al* 2011) albeit in a much drier and cleaner environment.

Conclusion

By analysing and characterising the matrix of these deposits and comparing their results with other environmental studies across the site as well as with wider micromorphological studies it has been possible to identify discrete floor surfaces including the apparent periodic resurfacing of occupation horizons with redeposited gravel and vegetation matting. The occupants of Cultra Loch crannog made clear and repeated attempts to maintain clean and dry floor surfaces. The analysis of dumped occupation and hearth debris has allowed for the location of general occupation and hearth debris which is apparently missing from within the compacted floor layers and will

hopefully contribute to a better understanding of site formation processes.

The wooden artefacts

Anne Crone

Introduction

Of the nine artefacts recovered from Cults Loch 3 functional labels can be readily ascribed to only two of them, the box and the ardshare, and other contemporary examples of these are known. Comparanda for the other artefacts have not been found and we can but speculate, on the basis of their morphology and manufacture, as to what their function might have been. For instance, SF42 ([Illus 72](#)) most closely resembles a cricket bat except that it does not have a handle and the projecting 'nose' would have impeded any batting movement! T3 has clearly been carefully shaped and prepared but no function can be envisaged for it.

The box SF38 ([Illus 73](#))

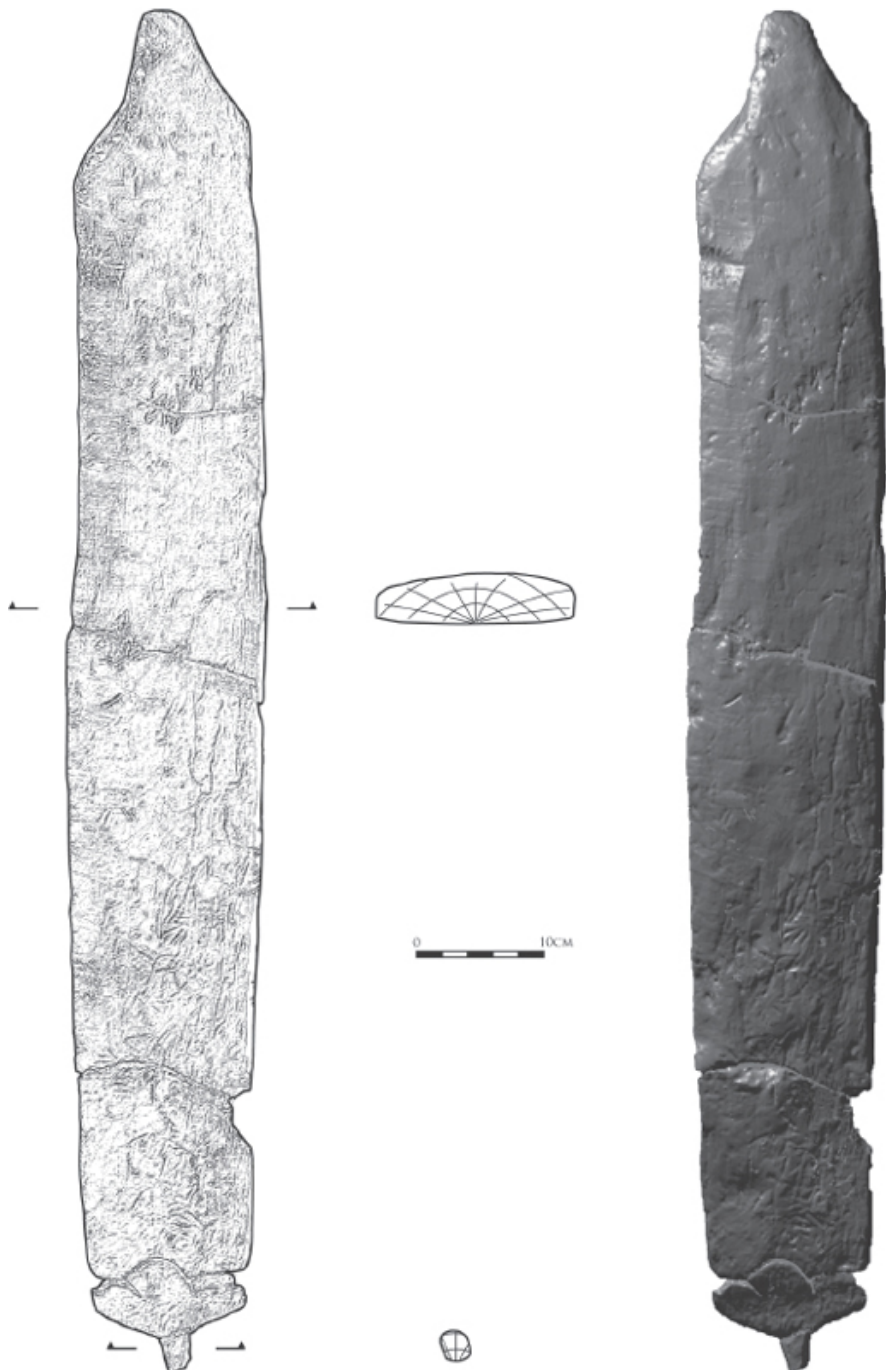
Examples of other Iron Age boxes from Scotland include an example from Oakbank crannog (Dixon 2004, 150 & plate 21) and one from the multi-vallate enclosure at Over Rig, Dumfriesshire (RCAHMS 1997, 84-6). A box was also found on one of the crannogs (No. 4) in Dowalton Loch; Stuart (1866, 120) records that '... a box, the interior of which was about six inches cube, with a ledge to receive the cover, very rudely cut out of a block of wood, were found. I saw this rude box, but it has gone to pieces since that time'.

Of the surviving boxes the Oakbank example is slightly larger and shallower than the Cults Loch box; it is c 220 mm wide, at least 200 mm long (it was broken across its length), and c 45 mm in height. It was also fashioned from a half-log of alder (Sands 1997, 48) but it differs significantly from the Cults Loch box in that its base is pierced by three holes c 25 mm in diameter. As traces of butter were found on the internal surface it has been interpreted as a butter dish, the holes to allow the drainage of buttermilk. The Over Rig box is quite different in character; not only has it been very roughly fashioned from a radially-split plank of oak, but it is a much smaller object, only

126 mm long, 74 mm wide and 35 mm high. It tapers in width from 60 mm at one end to 74 mm at the other, and at the narrower end the walls of the crudely carved-out interior slope in at a shallow angle; it may have been used more as a scoop than a container. All that we can say of the Dowalton box is that it was of roughly similar dimensions to the Cults Loch and Oakbank boxes but square rather than rectangular.

Like the Cults Loch box, both the Oakbank and Over Rig boxes are monoxylous, ie carved from a single piece of wood. Only one other Iron Age wooden box is known from the British Isles but this appears to be a composite construction, with separate walls and base. The wooden box from Dorton, Bucks contained a La Tene decorated mirror and survived only as wood fibres, the alignment of the fibres suggesting that different components had been used (Farley 1983).

A variety of monoxylous containers are known from Iron Age contexts throughout the British Isles; carved troughs, carved and turned bowls, tubs fashioned by hollowing out logs (see below), as well as stave-built tubs and tankards (Earwood 1993), and all presumably had specific functions, most of them related to the preparation and consumption of food and drink. The angular box, with its corners and crevices seems more suited to storage, although the Oakbank box would contradict this suggestion. There are many more monoxylous box-like containers of Bronze Age date, some with lids, and these were used to store objects of value, such as gold lunulae, fibulae and flint hoards (Coles *et al* 1978, 16; Earwood 1993, 41-2). Most of these examples are Irish, where they were generally found deposited in peat bogs. In the UK wooden boxes of Bronze Age date have been recorded at Flag Fen, Cambridgeshire (Pryor 2001, 227-8 & Fig 10.11), Cogie Hill Farm, Lancashire (Howard-Davis *et al* 1988, 17) and Srath Mor, Islay (Earwood 1998, 162-3), again all in non-domestic contexts. The Cogie Hill Farm box contained a LBA metalwork hoard, while the Flag Fen box was carefully carved to mirror the shape of the bronze shears that it contained. The position of the Cults Loch box, sealed under the floor of ST1, is indicative of deliberate deposition rather than discarded rubbish, and draws parallels with the Bronze Age examples above. In particular depositional contexts containers appear to have been invested with symbolic status, acting as a metaphor for the fertility and bounty of a successful agricultural year perhaps; the numerous finds of wooden bog-butter containers from Scottish bogs could be viewed in this light (Hingley 1992, 24), as might the bowls from Dowalton Loch (Hunter 1994) and the cauldrons in Carlingwark Loch (Piggott 1953), to use some local contemporary examples.



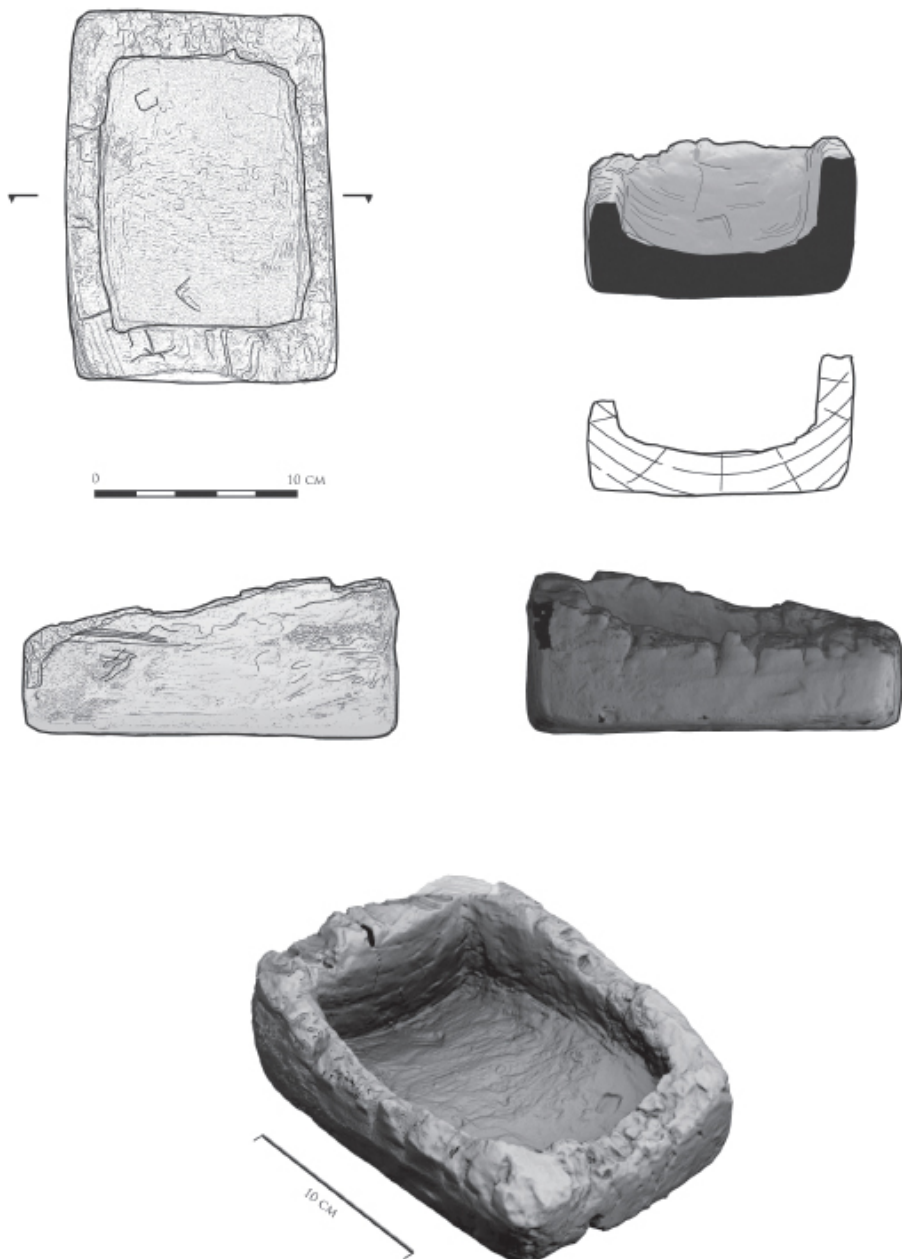
Illus 72. The bat-like object SF42 (solid mesh derived from laser scanning)

The ardshare SF22 ([Illus 74 & 75](#))

The ardshare is part of a composite tool, the bow-ard, which consisted of a curving beam with an aperture at one end through which the

mainshare and the foreshare were inserted, with a separate stilt extending out behind the beam. The draught animals were yoked to the beam at the other end and the share cut through the soil at an angle, the direction of the ard controlled by using the stilt. The component found at Cults Loch is the mainshare, over which the foreshare was fitted. The foreshare would probably have been of iron or stone to bear the brunt of the wear, although wooden examples are also known. The Cults Loch ardshare was intended for an implement most akin to bow-ard ([Illus 76](#)), like the Donnerupland ard which was found complete in a peat bog in Denmark, and which had a wooden foreshare (Reynolds 1982).

The Cults Loch example belongs to a European-wide group of long-shafted ard shares with arrow-shaped heads, the evidence for which has been most recently and usefully summarised by Raftery (1996, 244–246; 266–275) following the discovery of an ard-head under the Corlea 1 trackway. The majority of the radiocarbon-dated examples have yielded 1st millennium BC dates (*ibid* 270–272), and a mid-1st millennium BC date was also recently obtained from one of the stilts from Virdifield, Shetland (Murray 2011). Most ard shares have been made from oak, although alder and lime was used for some Danish examples (Raftery 1996, 266).

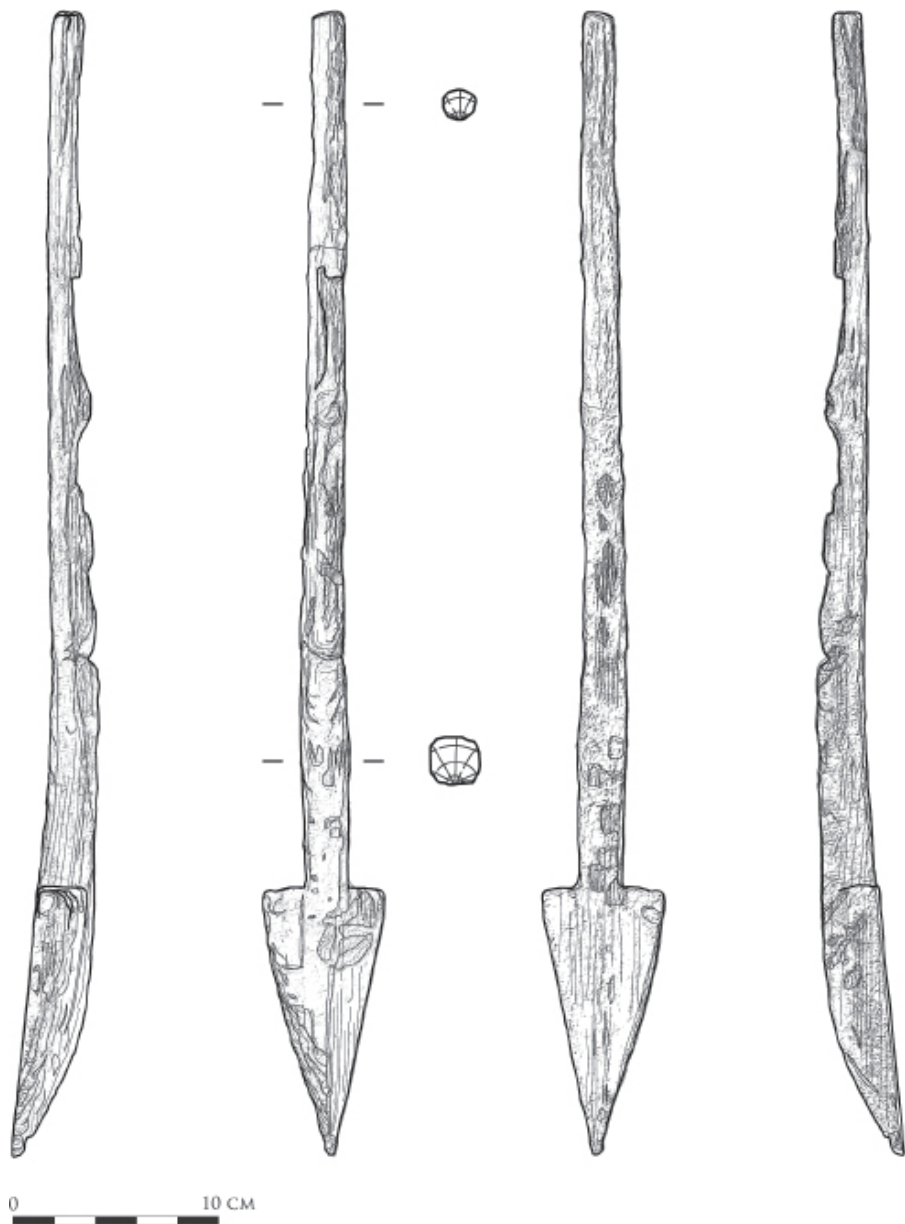


Illus 73. The box SF38 (solid mesh derived from laser scanning)

There are four other ard shares from Scotland, one from Milton Loch crannog (Piggott 1953), two from Virdifield, Shetland (Rees 1979, 44; Murray 2011) and one from Dundarg, Aberdeenshire (Rees 1983). With the exception of the Dundarg example, all of them are complete and are remarkably uniform in size, with overall lengths of ranging from 1.23 m to 1.27 m and heads ranging in length from 0.21 m to 0.29 m and in width from 0.10 to 0.13 m (Illus 77). At 1.12 m in

overall length the Cults Loch ardshare is a little smaller than the other Scottish examples but the head fits well within the range. Indeed, the Cults Loch ardshare is so similar to the Milton Loch example in design and size that one might postulate the same manufacturer. The 'paddle' found by Mapleton (1867) in Loch Kielziebar, Argyll should perhaps also be included in this list; although there is no illustration he described it as '... like a barbed arrow – rather convex on one side, and concave on the other' (ibid 323) and the dimensions are roughly comparable, an overall length of c 1.41 m, with a head 0.21 m long (although the tip was broken off) and 0.2 m wide.

Scotland has also produced two beams from a boward, one found with the two ard shares from Virdifield, and another from Lochmaben; both have also yielded 1st millennium BC dates (Murray 2011, 40; Rees 1979, 44). A wooden yoke, which would have formed the attachment between beam and traction animal, was also found at Lochar Moss, near Dumfries, associated with a La Tene sword (NY07SW 5; Truckell 1964, 59).

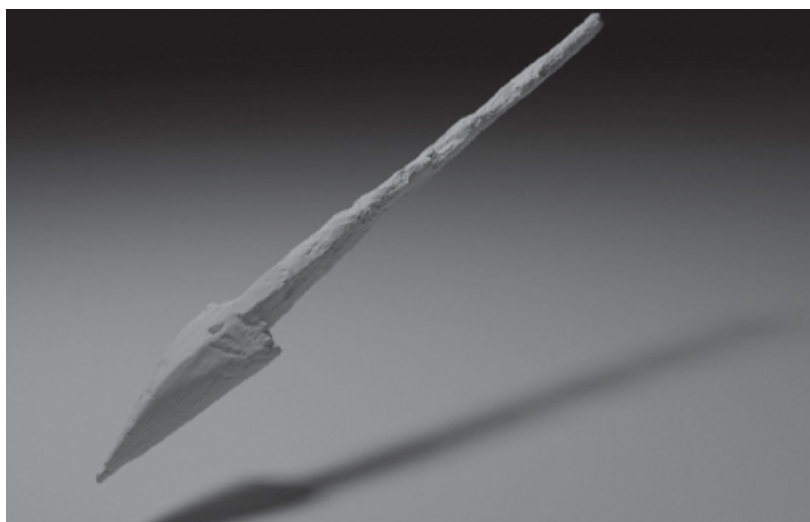


Illus 74. The ardshare SF22

Most of the long-shafted ard shares from Britain and Ireland show evidence of use; they are usually highly abraded and assymetrical in shape, and they also display flattened upper surfaces, often with a ridges on either side of a shallow depression along the axis, where the foreshare would have been seated (Raftery 1996, figures 390, 392 & 393). In contrast the Cults Loch ardshare had never been used; the head is symmetrical, all the surfaces are smooth and the edges, particularly the axial ridge, are sharp. Some of the Danish examples

may also not have been designed for use, either because their design would have made them inefficient to use (Rees 1979, 34) or because they were made of unsuitable woods, such as alder and lime (Raftery 1996, 266).

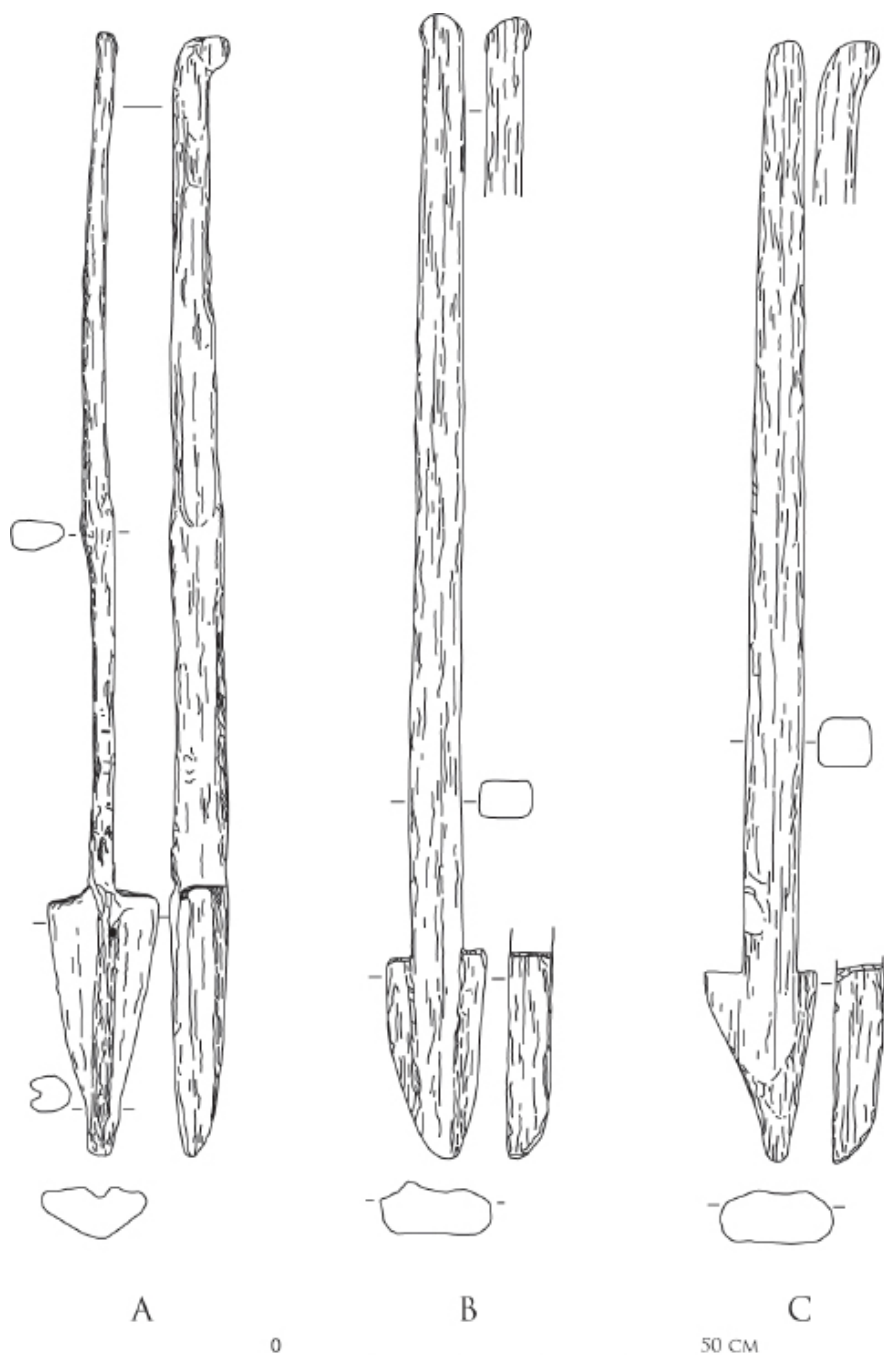
All of the Irish ard shares, with the exception of the Corlea ard-head, have been found in isolation in peat bogs, as have most of the European examples. The Virdifield ard shares and beam were also found together in a peat bog (Murray 2011). The locus of their findspots (and the nature of some of ards – see above) has prompted suggestions of votive deposition and the ards are seen as part of a pan-European tradition of ritual behaviour which involves the propitiatory deposition of objects symbolic of fertility and plenty in watery locations (Bradley 1998, 171, 183). The Corlea ard-head and the Dundarg ard-head (found in the ditch of the promontory fort) may simply represent the discard of broken implements, but the ard from Milton Loch was, like the Cults Loch ard, placed under the floor timbers of the crannog and both must be viewed in the same tradition of propitiatory activity. Piggott was unequivocal about the purpose of the ardshare at Milton Loch; it ‘... was almost certainly deposited deliberately beneath the house foundations as a ritual offering to the gods who might provide good and abundant harvests.’ (Piggott 1953, 144). Such propitiatory activity must have been widespread amongst Iron Age crannog-builders; an ard, in this case a more primitive one-piece crook ard, was also recovered amongst the ‘lower floor-foundation’ timbers of the crannog at Oakbank (Dixon 2004, 152).



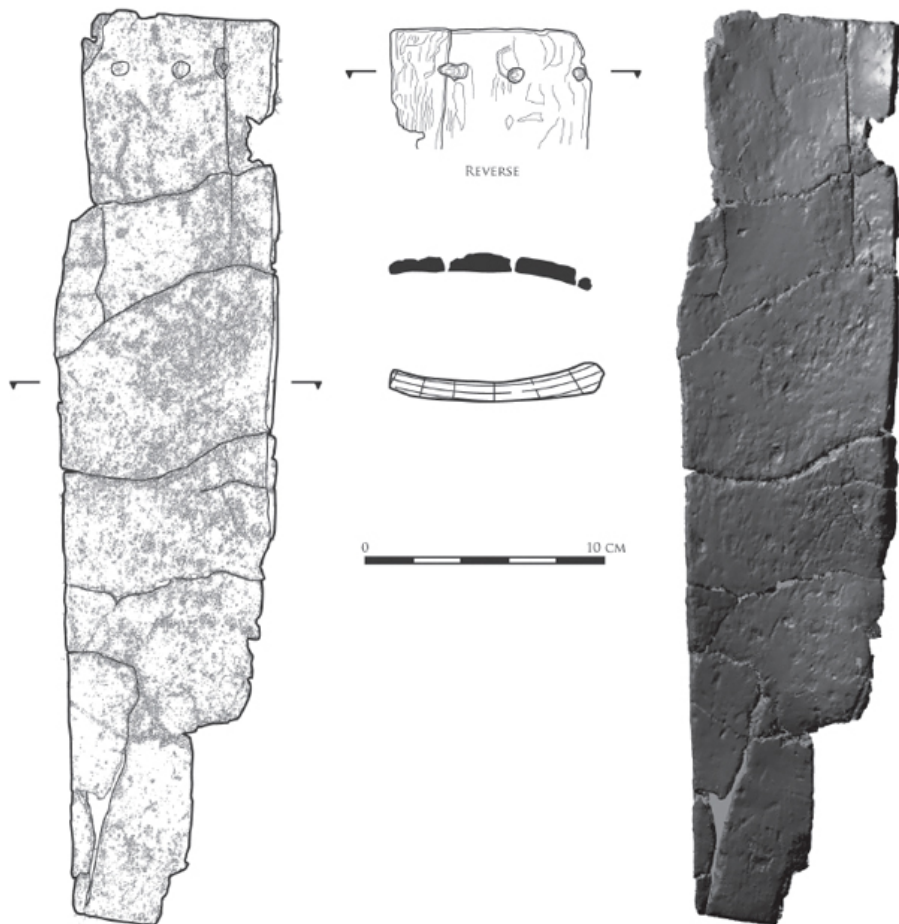
Illus 75. 3D image of the ardshare SF22



Illus 76. 3D reconstruction of a bow-ard based on the Donnerupland ard. The mainshare is modelled on that from Cults Loch 3



Illus 77. The wooden ards and shares from Milton Loch (A) and Virdifield (B & C) (after Rees 1979)



Illus 78. The board SF35 (solid mesh derived from laser scanning)

The boards SF24, SF35, SF36 & SF43 (Illus 78–80)

Four boards were found, all beneath the sub-floor (624) of ST2 (Illus 29). Apart from the variety of species used (two of alder, one of oak and one of ash) they all display a singular consistency of design and manufacture. At first glance they look like barrel staves; the long edges have all been neatly squared while the ends, where they survive, have been gently bevelled on one face. However, the ends on the two most complete examples, SF35 and SF43 are not square (Illus 78 & 79), but have been deliberately cut at a slight angle so that in shape they both resemble a parallelogram, a feature which would make their use as staves impractical. They are all broadly the same width (from 160 mm to 190 mm at their maximum) but there is greater variety in their thickness, from 11 mm to 24 mm at their thickest. However, they all taper in thickness along their length. The only complete example, SF35, is 0.75 m long; SF43, which may be

complete but one end is too decayed to be sure, is slightly shorter at 0.65 m.

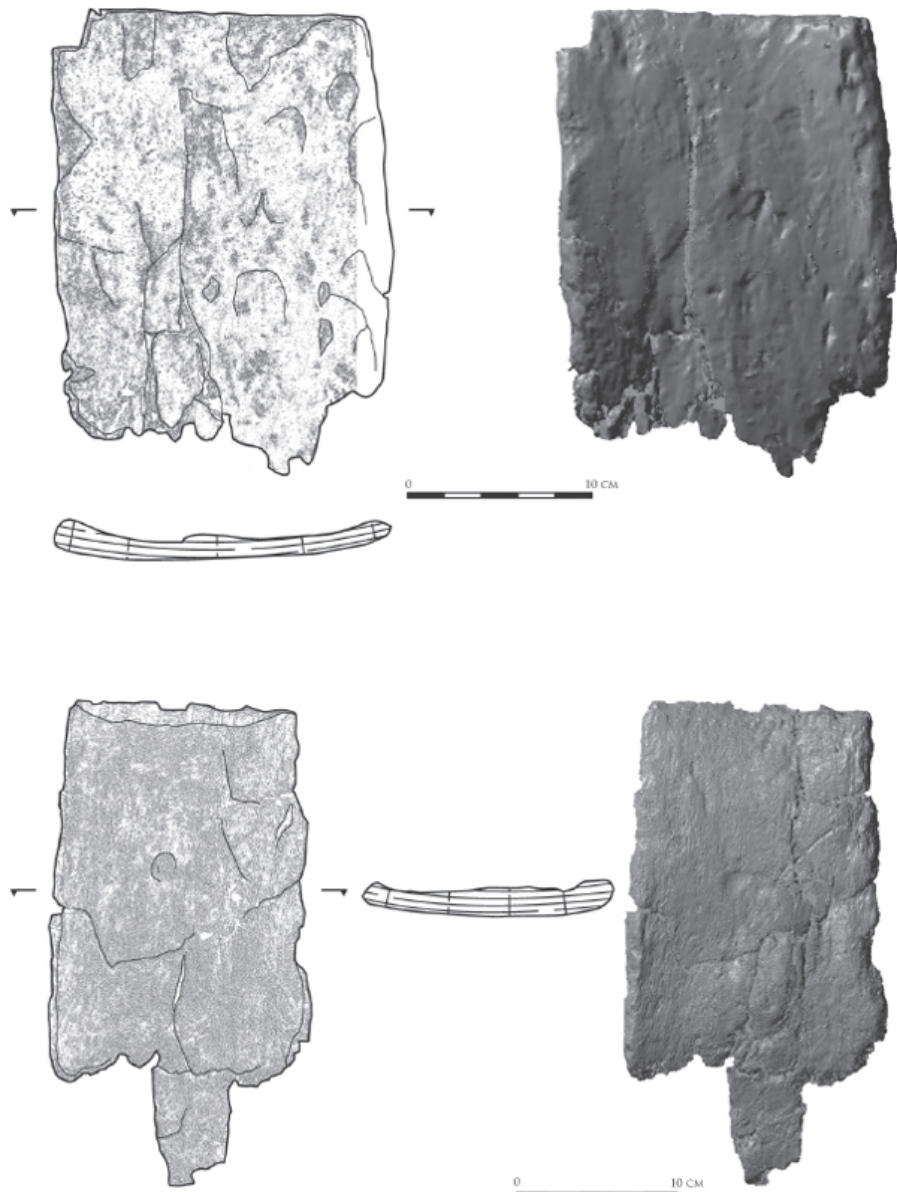


Illus 79. The board SF43 (solid mesh derived from laser scanning)

The most distinguishing feature of the boards, however, is the way in which they have been converted from the parent log. They have all been converted tangentially from the outer rings of the log so that the growth rings are aligned with the flat faces of the boards and this has resulted in a pronounced curvature across the width of the object. This is an unusual sort of conversion to obtain a thin board; it would have been much more straightforward and less time-consuming to radially-split the log into thin sections. There are two ways that this type of tangential conversion could have been achieved; the log could have been radially-split into the requisite size of billet, ie the width of the board, and then the wood from the centre chopped away until the board was of the required thickness. Alternatively, the whole log could have been hollowing out to the required thickness and the resulting shell then split into sections. This method of hollowing out logs was commonly used during the Iron Age to produce twopiece

containers, a separate base being inserted at one end (Earwood 1993, 57–60, 107; Raftery 1996, 263–266), and Earwood (1993, 67) has suggested that it was the natural splitting of such vessels down the grain that prompted the development of stave-built containers. However, there is no evidence that the boards had formerly been staves; as described above, some of the surviving ends are not flat and there are no signs of the binding hoops that would have been necessary to retain them in a vessel.

A lot of care went into the preparation of the boards; where the faces of SF35 are well-preserved they are smooth and regular, with no visible toolmarks, which suggests that they may have been sanded. The number of species used is also intriguing, and one possible interpretation is that different groups or individuals made them separately but to a general template. No comparanda for the boards have been found and no obvious function, other than that prompted by their similarity to vessel staves, springs to mind. The suggestion that they are representative of a vessel, or container is also prompted by the deposition of another container, the box under the floor of ST1 (see above). Like the ardshare the boards may have been prepared as imitations of staves, and were never intended to be used as such.

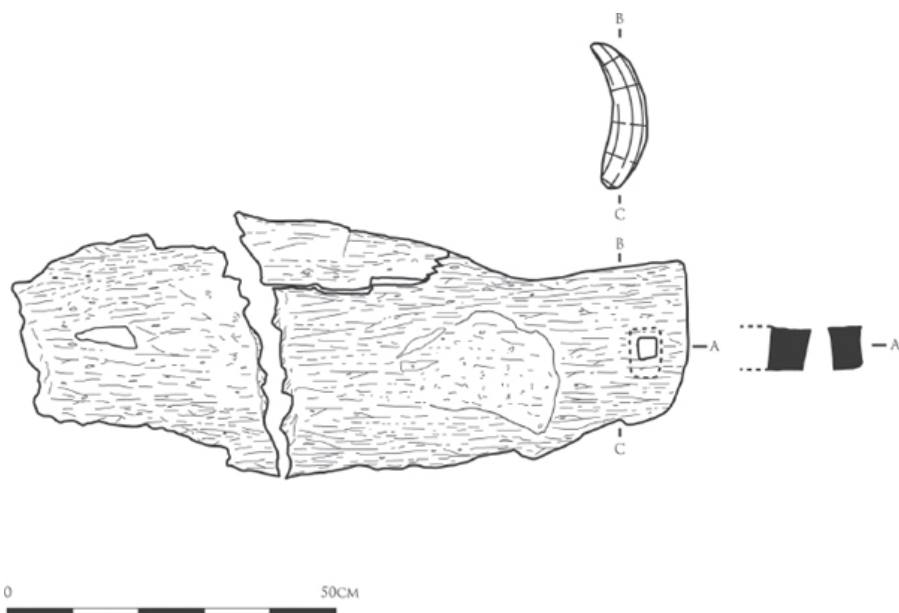


Illus 80. The boards SF24 & SF36 (solid mesh derived from laser scanning)

The burrwood slab T157 (Illus 81 & 82)

Clues as to the function of T157 must surely lie in the charring of the upper surface. It seems most likely that the hole in the 'handle' was made so that the massive object could be dragged from the woodland to the crannog. The contorted grain of burrwood make it dense and resistant to splitting so it was valued for hammering tools such as mauls, mallets and beetles (Sloane 1973, 28–32). For the same reasons the burr would have provided a very durable surface for activities

involving chopping, beating and mashing, while the concave surface would have contained the materials being chopped, beaten or mashed. However, there is no evidence to suggest that this is what the slab was used for. Instead, the charred upper surface suggests slow, controlled burning, while the absence of any charring around the sides or lower surface suggests that it might have been placed in a shallow pit or trench. This brings to mind the pits or troughs commonly found at the core of burnt mounds, some local examples of which were lined with large oak timbers. The base of the pit in the Bronze Age burnt mound at Dervaid, Glenluce was lined with a large tangentially split oak plank, 2.25 m long, 0.75 m wide and 0.17 m thick (Russell-White 1990, 74), not dissimilar in size and construction to T157. A chord off a large oak timber, 3 m long and 0.8 m wide, was also found in the base of the trough of the burnt mound at Cleuchbrae Linn, Johnstonebridge, also Bronze Age in date (Duncan & Halliday 1997). The burnt mound might have been somewhere relatively close to the crannog; a spread of fire-cracked stone, such as that produced by burnt mounds was used as foundation material in ST3 (see [Chap 2a](#)).



Illus 81. The burrwood slab, T157 – measured sketch (T157 was so massive that it had to be lifted by a mini-digger and it broke under its own weight. It was recorded on site and subsequently reburied there)



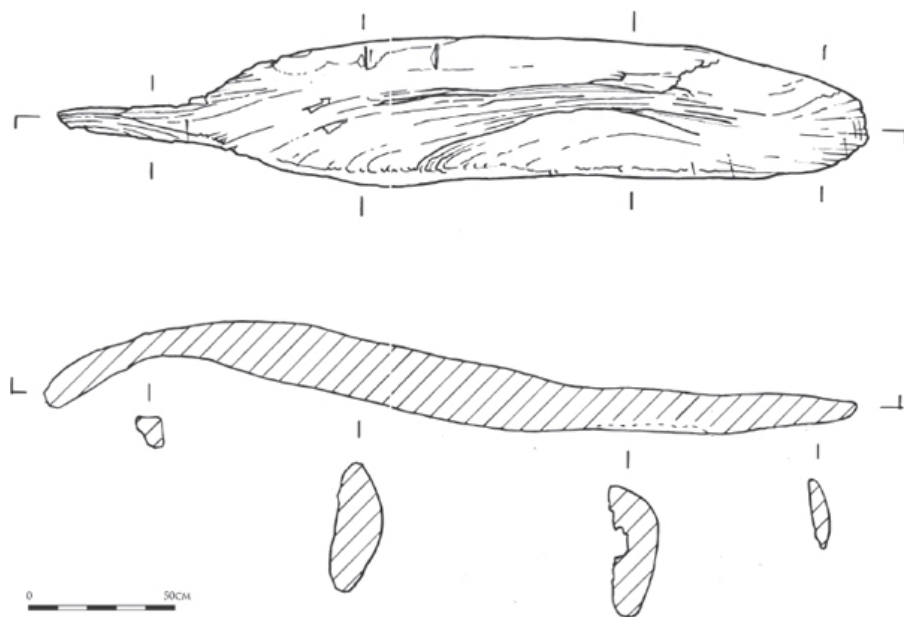
Illus 82. The burrwood slab, T157 after cleaning on site

In discussing T157 and other wood-lined burnt mound troughs attention should be drawn to a curious wooden object found while dredging the Piltanton Burn, some 4.5 km SE of Cults Loch (NX15NW 10; Museum Cat No 2001.32). This shaped log of oak is longer and narrower than T157 (2.8 m $\times$ 0.46 m) but it is morphologically similar, in that it has a distinct ‘handle’ and ‘bowl’, and it also bears signs of charring on the concave face ([Illus 83](#)). The object was described as a canoe when first found (McCaig 1955) but Mowat (1996, 103) subsequently dismissed it as such on the basis of its overall morphology and size. As burnt mounds are often located close to watercourses it is possible that the Piltanton Burn ‘canoe’ is actually the liner for another burnt mound pit.

Discussion

The crannog has not produced an assemblage of domestic artefacts like that from Oakbank crannog (Dixon 2004, 146–154) but this is probably due to survival, the occupation deposits lying mainly within the decay horizon. With the exception of T3 which was found in the decay horizon, all the wooden artefacts described above were found below the occupation deposits. T157 was found within the foundations of the crannog while all the other artefacts were found below the floors of ST1 and ST2. While T157 could be viewed as large relict piece of timber useful for building up the foundation, the position and nature of the other objects make it more difficult to view them simply as discarded items used to build up the crannog. Rather, the objects have been deliberately placed on the surface of the crannog and then sealed by the construction of the primary floors in ST1 and ST2, a symbolic act of deposition. The symbolism of the ardshare is overt, an implement essential for successful agricultural production, while the box and the boards could also be viewed within

the context of the agricultural cycle, as symbolic containers for the bountiful agricultural produce that the occupants might anticipate by their actions (Williams 2003). By extension of this analogy the bat must therefore also represent an agricultural tool.



Illus 83. The Piltanton Burn 'canoe' – measured sketch by J Pickin

The burial of foundation deposits designed to bring good fortune to the house and its occupants is a practice that continued well into the modern period (Hukantaival 2007) and these wooden artefacts may be no more than an expression of that cultural practice. However, the incorporation of objects associated with agricultural production and fertility in unusual places within domestic buildings is part of a more widespread pattern of deposition observed throughout northern Europe in the later prehistoric period, a pattern which has been interpreted as reflecting the merging of the ritual and domestic spheres of life (eg Hingley 1992, 23–24; Williams 2003). Williams (ibid 228) has proposed that during this period the agricultural cycle became the principal organisational metaphor which helped people to understand their role in the world. The use of agricultural symbols was a means of making explicit the connection between the life-and-death cycle of the natural world and the life cycle of the household, or as Williams (ibid 241) has expressed it, the objects acted as a solid metaphor which shifted the context between the agricultural world and that of the settlement.

The variety of the objects buried at Cults Loch 3 appears

idiosyncratic (particularly if the cache of quartz pebbles under ST3 is considered to represent the same type of deposition: see McLaren below), and may reflect the very personal scale of this cultural practice. The choice of these objects may also have been designed as a statement of identity; we could speculate that the occupants of ST1 were the cultivators, while those of ST2 were the processors of foodstuffs, for instance.

Catalogue of wooden artefacts

SF22 (*Illus 74 & 75*)

Description: ardshare

Condition: complete

Species: Oak (*Quercus* sp.)

This ardshare has been fashioned from a half-log of oak, the split face forming the lower surface of the ard head. It is 1120 mm long from tip to upper end.

The head is 260 mm long, 120 mm wide at the junction with the shaft, and 52 mm deep at the same point. The shoulders of the head lie at right angles to the shaft and it tapers to a fine tip, which lies slightly asymmetrically to the axis of the stilt. A prominent ridge defines its spine starting 60 mm from the junction with the shaft and curving down to the tip; again, this ridge lies just offcentre from the axis of the shaft. In cross-section the head is virtually triangular, although the upper surfaces on either side of the ridge are slightly convex while the lower surface is slightly concave. Large smooth facets are visible on either side of the ridge; these may have been from the initial shaping. Although the head is beautifully shaped, and there is little damage to it, no toolmarks are visible and it is possible that the surfaces were deliberately smoothed, possibly by sanding. The underside is particularly smooth.

The shaft is rectangular at its junction with the head; it is the same depth as the head at this point but is 42 mm wide. It maintains this profile for about 250 mm along its length but beyond this, the shaft has become dessicated and is also mechanically damaged. Despite this damage it is clear that the shaft probably did taper along its length to a smaller, more rounded cross-section at the upper end. At this end it is only 30 x 35 mm in cross section. There is a pronounced curvature along the length of the shaft, the lower surface arching, dipping down and then curving back up at the upper end.

SF24 (*Illus 80*)

Description: board?

Condition: decayed & incomplete

Species: Alder (*Alnus glutinosa*)

This object consists of a thin rectangular board of alder, converted from the tree in such a way that the rings lie parallel with the flat faces. The slight curvature across the width of the object may be as a result of this conversion. It is 160 mm wide at its maximum and 300 mm long but neither dimension is complete. It is 11 mm at its thickest point but tapers to 5 mm at the broken end and to a chisel edge at the complete end. Although decayed this end has clearly been neatly squared.

The surfaces of the object are too decayed to see tool-marks.

SF35 (*Illus 78*)

Description: board?

Condition: complete but fragmented

Species; Ash (*Fraxinus excelsior*)

This object consists of a board of ash, converted from the tree in such a way that the rings lie parallel with the flat faces. There is a pronounced curvature across the width of the object which is probably a result of this conversion. The object is 750 mm long and 180 mm wide. It tapers from 18 mm in thickness at one end to 10 mm at the other. The long edges of the object have been neatly dressed square, as have both ends, although the ends have been cut at a slight angle so that the overall shape of the object is that of a parallelogram. At the thicker end the wood has also been neatly bevelled on one face. At the thinner end a line of 3 small holes penetrate the board. They all lie 35 mm from the end and lie 50 mm apart. Two of the holes are neat circles, 4 mm in diameter but the third hole is less regular. A fourth hole lies beyond this line of holes, towards the corner of the object. This hole is 7 mm in diameter and lies only 20 mm from the end.

The surfaces of both faces of the board are wellpreserved in places. They are smooth and regular, with no visible toolmarks, suggesting that they have been sanded. The figuring of the ash grain is pronounced. There is woodworm damage on both faces.

SF36 (*Illus 80*)

Description: board?

Condition: decayed & incomplete

Species: Alder (*Alnus glutinosa*)

This object consists of a thin rectangular board of alder, converted from the tree in such a way that the rings lie parallel with the flat faces. There is a pronounced curvature across the width of the object which is probably a result of this conversion. The object is 250 mm long and 180 mm wide. The length is incomplete but the width may be complete; one edge is decayed but still straight and parallel with the other, better preserved edge. One end is neatly squared, as is the better preserved edge. The object tapers from 17 mm in thickness at the squared end to 10 mm at the decayed end.

The surfaces of the object are too decayed to see toolmarks. There is woodworm damage on the concave surface.

SF38 (*Illus 73*)

Description: box

Condition: whole but damaged

Species: Alder (*Alnus glutinosa*)

This rectangular box has been converted from a half-log of alder in such a way that the pith of the log lies along the median line of the box, ie the grain runs along the length of the box. The box is 182 mm long externally and varies slightly in width, narrowing from 120 mm at one end to 128 mm at the other. The vertical walls stand to a maximum height of 78 mm at one end but the rim has been destroyed by charring so the original height is unknown. Nonetheless, the position of the pith on the highest end suggests that the box would not have been much more than what survives. The charring extends down the long walls of the box and has all but destroyed one end wall, but the interior of the box has not been affected. The walls are all vertical but are rounded at the junction with the base. Along one long wall there is a pronounced chine. The interior of the box measures 130 mm × 98 mm; it is less rectangular than the external profile, the sides all bowing out slightly. The walls are thickest at each end, varying from 23 mm to 24 mm, and thinnest along the long walls where they measure only 12 mm to 14 mm at the point where the internal hollow bows outwards. The base of the box is quite flat but in the interior it is slightly dished; it is 140 mm at its thickest.

Faint toolmarks are visible on the exterior of the box. At the highest end there are a series of faint ridges which are probably toolmarks, while along one of the long walls, just above the chine there is a sequence of what look like shallow ripples, 9 mm to 10 mm wide, with a slight hook at the upper end. Toolmarks are better preserved within the box. On the internal face of the highest end there are a series of angled indentations up to 16 mm wide. The marks on the

interior and exterior walls could have been made using a small axe or a chisel. The interior of the box is less wellfinished than the exterior. The base of the box is covered in sharp cuts, vertical near the end walls and angled towards the centre. The longest cut visible is 43 mm. These could be the residual marks left by the initial clearing of the interior.

SF42 (Illus 72)

Description: bat-like object

Condition: fragmented

Species: Alder (*Alnus glutinosa*)

This object has been converted from a half-log of alder; the cleft surfaces of the split log form the flat underside of the object. The upper surface has been shaped to a gentle curve; the toolmarks are just visible in places. The object is 1.07 m long and 155 mm at its widest point, which is mid-way along its length. It tapers in width towards both ends, to 120 mm at one end and 135 mm at the other. It is 35 mm thick along the median line, tapering to 16 mm and 21 mm at the edges and to 20 mm at each end. The ends have been shaped in different ways. At the wider end the object has been shaped to a blunt point 35 mm across by means of long sloping, but asymmetric shoulders so that the point lies closer to one edge than the other. At the other end the object has also been shaped to a small projecting 'nose' by shallow, angular, but also asymmetric shoulders so that the 'nose' also lies closer to the same edge. The 'nose' is 25 mm wide and 30 mm long, but its complete length has not survived.

SF43 (Illus 79)

Description: board?

Condition: fragmented

Species: Oak (*Quercus* sp.)

This object consists of a board of oak, converted from the tree in such a way that the rings lie parallel with the flat faces. Indeed, the board has been fashioned from the sapwood, the outermost rings of the tree. There is a pronounced curvature across the width of the object at one end which is probably a result of this conversion. The object is 650 mm in length but is decayed at one end. It tapers in width from 190 mm at the decayed end to 140 mm at the other, complete end. Similarly, it tapers in thickness from a maximum of 24 mm at the decayed end to 10 mm at the complete end. The edges are all neatly squared, as is the complete end. This end has been cut at a slight angle

to the long edges; the decayed end is similarly angled so the overall shape of the board may have been more of a parallelogram than rectangle. An irregular hole, c 10 mm across lies 70 mm from the complete end and there is also a possible hole at the decayed end.

The surfaces of both faces are smooth and there are no visible toolmarks.

T3

Description: plank with handles?

Condition: complete but decayed

Species: Oak (*Quercus* sp.)

This object has been fashioned from a half-log of oak at least 2 m in length; the ends of the object are too decayed to be certain that they are original. The centre of the object is plank-like, having been reduced, over a length of 1.12 m, to a rectangular cross-section 220 mm wide and 60 mm thick. In plan the plank tapers to handles at either end, but in section the handles are thicker than the plank and the plank is slightly dished on one face. The handles are both 0.59 m long and roughly circular in cross-section, 90 mm by 100 mm.

The surfaces are too decayed to see toolmarks.

T157 (*Illus 81 & 82*)

Description: worked slab of burrwood

Condition: complete but fragmented

Species: Oak (*Quercus* sp.)

This object is a massive slab of oak 2.04 m in length and 0.74 m at its widest point, the grain running along its length. In plan it resembles an elongated spoon but with irregular edges. The 'handle' is 0.5 m wide and 100 mm thick at the end, which is neatly squared, with faint axemarks visible on the surface. Some 100 mm in from the squared end and roughly central to the 'handle' is a square hole which penetrates the slab. On the upper surface the hole is roughly 40 mm by 40 mm but it splays out to the lower surface where it becomes a roughly rectangular hole 100 mm by 130 mm.

The 'bowl' has been fashioned out of a gigantic burr c 150 mm thick. The upper surface of the object is slightly concave but uneven, and is completely charred to a depth of c 5 mm except for a small strip along the edge of the 'handle'. The contorted grain of the burr is visible on the upper surface and there are two possible chopmarks towards the tip, 40 mm and 50 mm wide. The lower surface is convex, uncharred and unworked, the original dimpled surface of the burr still

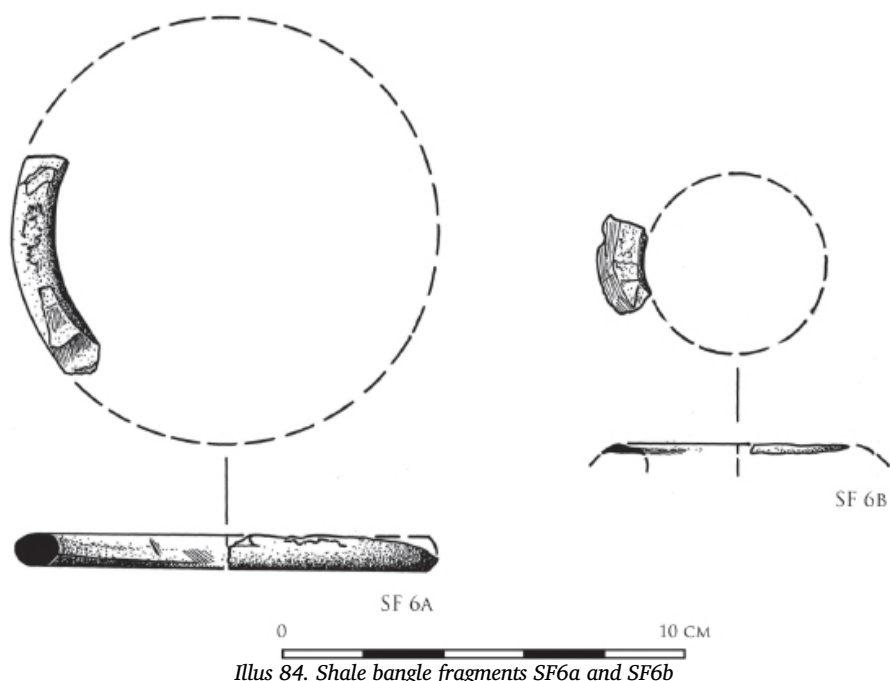
visible.

The burr has been cleft off the trunk of a large oak tree, but in such a way that some trunk wood has been left attached and the 'handle' has been fashioned from this wood. The concave nature of the upper surface appears to be natural as it follows the curvature of the ring pattern. This curvature suggests that the burr came from a tree in excess of 1 m in diameter.

The shale

Fraser Hunter

Two finds of shale were recovered from topsoil over the crannog: a bangle fragment and a flake accidentally detached from an unfinished bangle (Illus 84). The finished bangle is an unusual form, its deep D-shaped profile and rounded inner face giving it a rather oval section in contrast to the normal D-shape. Such bangles are often dismissed as typologically undiagnostic (eg McLellan in Rideout *et al* 1992, 102, 124), but more careful study is beginning to reveal some patterns (eg Hunter 2008, 105–106). The oval form is unusual; from a sample of over 220 later prehistoric bangles, only six have similar oval sections, all from southwest Scotland. Apart from Cults Loch 3, they come from Barhapple, Wigtownshire; Dundonald, Ayrshire; Dunagoil, Bute; Sheep Hill, Dunbartonshire; and Dunadd, Argyll (Maxwell 1889, fig 30; Hunter 2004, fig 46 no 82d; Bute Museum, unregistered; Hunterian Museum A1971.116; NMS HPO 39; a further Ayrshire find, from Harpercroft, said to have an oval section, is not illustrated and poorly described (McLellan in Rideout *et al* 1992, 158)). This is taken from work in progress and not all extant bangles have yet been seen, but it suggests this was a regional type. None are from well-dated contexts, but most come from sites with pre-Roman or Roman Iron Age occupation; Dunadd is primarily early Medieval, but it also has an Iron Age phase, so an Iron Age date may be proposed which further discoveries may refine.



Illus 84. Shale bangle fragments SF6a and SF6b

The flake from an unfinished example is valuable evidence for manufacture on site. The raw materials are not locally available (cf Gibson 1922), and must have been imported either as blocks or as part-finished roughouts; the evidence of a single flake is insufficient to judge. Similar working evidence comes from other Wigtownshire Iron Age sites, but none have produced large quantities of debris: this seems to have been an occasional craft activity, perhaps because the material was locally scarce. Ornaments in this material are recorded from the crannogs of Airrieolland, Barlockhart, Barhapple, Dowalton and Whitefield Loch; at the latter two these are unfinished (Munro 1885, figs 32, 35–36; Black 1894, 33, fig 19; Maxwell 1889, fig 30–32; Cavers et al 2011, 95). The large assemblage of finds from Luce Sands cannot be closely dated; no other Iron Age sites in the area have produced evidence so far.

Catalogue of shale

SF08/6b Flake spalled from the surface of bangle roughout which had been perforated and was being abraded to the desired shape. The surviving outer face is notably curved, with extensive abrasion scars; a flat facet on top utilised the natural tabular surface, which shows only limited modification by abrasion. The interior is slightly rounded, with circumferential abrasion. The material is black, laminar and with a poor conchoidal fracture; analysis suggests it is an oil shale. L 24 m,

W 11 mm, T 3 mm; internal diameter (at this production stage) 40–45 mm (14% survives). Context 200, topsoil

SF08/6a Bangle fragment with very rounded, oval profile, the fairly flat edges rounding gently into the heavily curved exterior and less curved interior; the latter has an asymmetrical curve and preserves residual circumferential abrasion scars. The exterior is well-polished, but the surface has been badly damaged from use-wear and postdepositional wear. Very laminar and inorganic – oil shale. L 55 mm, W 10.5 mm, H 9 mm; internal diameter 80–85 mm (20% survives). Context 200, topsoil

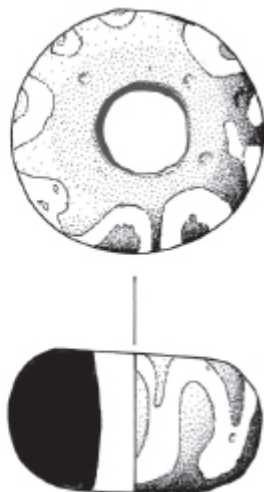
The glass bead

Fraser Hunter

This blue glass bead with white wave-trail decoration ([Illus 85](#)) belongs to Guido's Group 5a, a long-lived type which starts in the earlier Iron Age and runs to the 6th or 7th century AD (Guido 1978, 62–64; 1999, 53, 267–269, type 6ix for Anglo-Saxon examples). Secure early dates in Britain come from examples associated with East Yorkshire burials, mostly of 4th/3rd century BC date, at Arras, Cowlam and Rudston (Guido 1978, 62–64; Stead 1979, 80–81; Stead 1991, 92). The Cults Loch bead falls into this Early Iron Age horizon: although it comes from the decay horizon, it is argued to be contemporary with activity on the crannog, suggesting a 5th century BC date. This is very valuable evidence for the early dating of the type. Guido (1978, 132) lists Scottish examples, and there have been few recent finds; other local examples come from the complex stone dun at Castlehaven, Kirkcudbrightshire, and near the hillfort of Castle O'er, Dumfriesshire.



Illus 85. The glass bead SF09/19



Analysis of the glass demonstrates a soda-lime-silica composition consistent with the composition of Iron Age and Roman glass which was manufactured in the eastern Mediterranean (Davis, [Appendix 4](#)).

SF09/19 Annular bead with flattened ends and D-section; mid-blue translucent glass decorated with an opaque white wave trail set into the surface. This trail was not particularly expertly applied. It is more zig-zag than wave and varies in width, with blobs at the ends of each zig-zag. The ends of the trail do not join, and indeed an irregular junction suggests it was applied in two parts. The whole surface is rather worn, but greater wear on the ends suggests use in a necklace rather than a pendant; the section tapers very slightly, which would suit this use. Diameter 12.5–13 mm, thickness 6.5–7.5 mm, perforation D 4.5 mm. Context 517 (decay horizon)

The coarse stone

Dawn McLaren (with geological identifications by Fiona McGibbon)

Introduction

A total of 31 worked stones from Cults Loch crannog were recovered during four seasons of excavation between 2007 and 2010 ([Illus 86–88](#)). (Two stones, a possible hammerstone and rubbing stone, were not available for examination at the time of reporting.) The classification of these objects follows the identification noted in the field. Despite the large scale of excavation, this assemblage is both small and rather limited in range. As is typical of later prehistoric coarse stone assemblages from southern Scotland the assemblage is comprised primarily of cobble tools (20) displaying a range of use-wear types

and food processing tools in the form of saddle querns and rubbing stones (11). In addition to the stone tools recovered, a cache of unworked quartz pebbles (SF 07/05) was noted during excavation. The assemblage is summarised by [Table 10](#).

Discussion

Resources and raw materials

All of the coarse stone tools from Cults Loch 3 have been produced from water-worn rounded cobbles or glacial erratic boulders which have seen little to no modification or preparation prior to use with the exception of some of the saddle quern and rubbing stones (eg SF 09/01, SF 09/02, SF 10/10, SF 10/25). Specific lithologies appear to have been favoured for particular functions: granite boulders were preferred for use as saddle querns (eg SF 09/13, SF 10/10, SF 10/25) whereas the rubbing stones tend to utilise denser, harder-wearing diorite cobbles. The cobble tools have been made from range of stone types with a preference towards quartzite-rich, ovoid cobbles. The robust quality of quartzite-rich stone makes them particularly suitable for use as heavy pounding or abrasive tools. In contrast, stones used for sharpening the edges of metal blades display a clear preference for elongated ovoid, fine-grained greywacke (lithic arenite) cobbles. A full discussion of the lithology of the stones is available in the site archive.

Table 10a. Summary of assemblage by tool type

Type	No. present	Multiple/secondary function
<i>Food Processing</i>		
Rubbing stones	6	1
Saddle querns	5	
<i>Cobble tools</i>		
Grinders	4	4
Pounders	6	3
Hammerstones	2	
Whetstones	2	1
Smoother		?2
Working surface		3
Multifunction tools	6	
Total	31	

Table 10b. Coarse stone tools by structure

Small find no.	Type	Structure
SF 09/25	Grinder	1
SF 10/21	Combination tool	1

SF 10/39	Combination tool	1
SF 10/02	Rubbing Stone	2
SF 10/41	Rubbing Stone	2
SF 10/25	Saddle Quern	2
SF 10/03	Grinder	2
SF 10/15	Grinder	2
SF 10/26	Pounder	2
SF 10/27	Pounder	2
SF 10/28	Hammerstone	2
SF 10/04	Combination tool	2
SF 08/11	Whetstone	3

Cobble tools: wear patterns and aspects of use

Cobble tools form a significant component of most Iron Age stone tool assemblages in Scotland (Clarke 2006, 1). Classification of tool types here is based on the nature of the wear, following the scheme used in the Howe report (Ballin Smith 1994, 196). This approach is not without problems as this describes wear rather than function and different stone types will wear differently due to their varying properties. Yet it is argued that differences in wear most likely reflect different functions and this detailed form of classification allows a more detailed understanding of the mechanics of use.

The cobble tools from Cults Loch 3 display a limited range of wear: abrasion from grinding, pitting from pounding, fracturing from heavy use as hammerstones, polish and staining from use as smoothers and dished abrasion from whetting metal blades. Most of the cobbles display single-function wear (13) although a small number of combination or multifunction cobble tools are present (5). These combination tools show a much wider range of use-wear than those with only single-function use with additional evidence of wear and secondary use as working surfaces (SF 10/06, SF 10/13 ([Illus 86](#)), SF 10/39). Most show only two distinct wear types (4), particularly abrasion and pitting from grinding/pounding, but two stones (SF 09/03 and SF 10/13 ([Illus 86](#))) display evidence of three separate functions. No distinctive size differences between the tools types (eg grinders and pounders) are noted at Cults Loch 3 as has been identified at elsewhere (eg Braehead, Ayrshire; McLaren & Hunter 2007, 224).

Most of the tools exhibit signs of considerable use in the form of well-developed, often multiple wear facets; SF10/08 being a notable exception displaying limited or even single use. Despite the extensive wear displayed, most were intact at the time of deposition and could presumably still be functional. Those that are broken (eg SF 09/03 and SF 10/04) are likely to have been damaged during use and were

no longer functional.

Many of the grinders, pounders and multifunction tools make use of ovoid or flattened spherical cobbles which display wide faceted bands of wear around at least three-quarters of the circumference. A similar sub-set of cobble tools were noted at the later prehistoric enclosure at Braehead, Ayrshire (McLaren & Hunter 2007). At Braehead, flattened spherical quartzite-rich cobbles consistently appear to have been chosen for a particular function that produced circumferential abrasion or pitting. Their specific use is uncertain.

Residue analysis

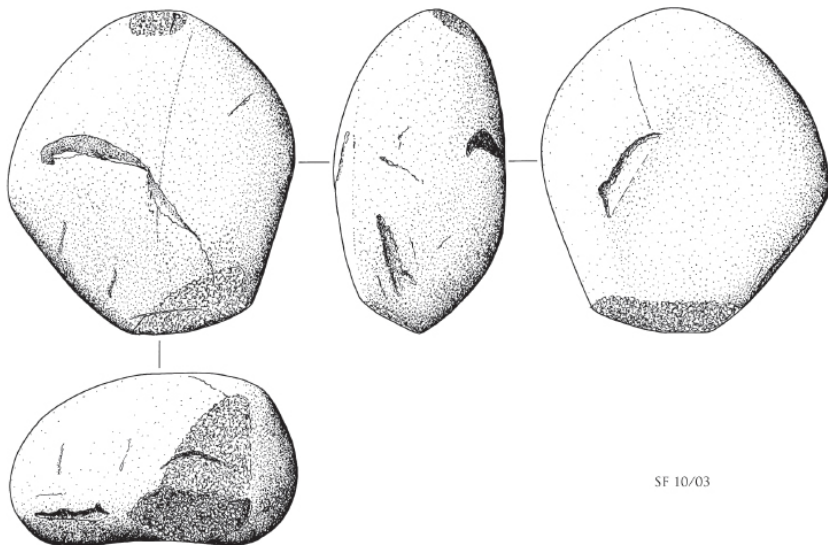
Many of the stones from the crannog are stained from the surrounding organic-rich, waterlogged soils and many have rootlet staining covering the surfaces. This postdepositional staining tends to be dark red-brown and is fairly homogeneous in both texture and colour, sometimes covering the whole stone (eg SF 09/01) and in other cases (such as SF 10/14) forming a distinct 'tide line' indicating the depth of submersion. Two cobble tools, SF 09/03 and SF 10/27 ([Illus 86](#)), stand out from the rest of the assemblage due to the presence of possible pre-depositional staining on the surfaces. The pattern of staining on these specific stones appears inconsistent with that expected from postdepositional discolouration.

In the case of SF 10/27, a pounder, staining is present as discrete, well-defined curvilinear band of dark-brown residue on one face only. The shape and location of the stain appears similar to those seen on possible leatherworking tools, such as those from Dunadd, Argyll (Lane & Campbell 2000, 178–179) but lacks the associated abrasion or polish noted on examples from elsewhere to confirm this function.

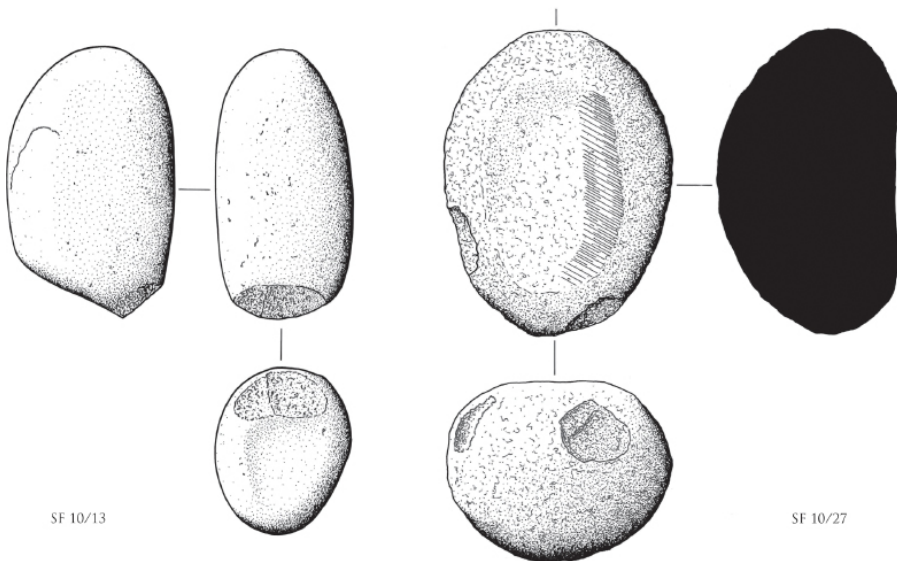
The surfaces of SF 09/03, a quartzite cobble grinder, are covered in an irregular series of curvilinear smears and oval smudges of dark brown staining. In contrast to SF 10/27, the stains appear absorbed into the surface of the stone rather than surviving as perceptible adhering residue. In terms of the character and form of the staining itself, the marks are similar in colour and texture to those seen on painted pebbles (Ritchie 1972; 1998) but lack any regular pattern which might indicate deliberate decoration or design. The position of the marks on the surface of the stone and their shape make it tempting to see these stains as finger-tip smudges remaining from handling but this is purely conjecture. If this is the case and the staining relates directly to the use of the tool as a grinder it is puzzling that the staining does not concentrate on the areas of abrasion. Instead, the stains mark the surfaces where the user would have gripped the stone

suggesting that the last person to use the tool before it was discarded may have had some form of pigment-rich substance on their hands which was transferred onto the surface during use.

In order to identify the substances further, the two stones were submitted for chemical analysis by Gas Chromatography-Mass Spectrometry (GC-MS) at the University of Bradford. Samples were taken from areas of staining on both stones. Disappointingly the samples analysed contained no surviving indigenous lipids indicating that the organic component of the residues had degraded completely. A full report on the chemical analysis methods and results is available in the site archive.



SF 10/03



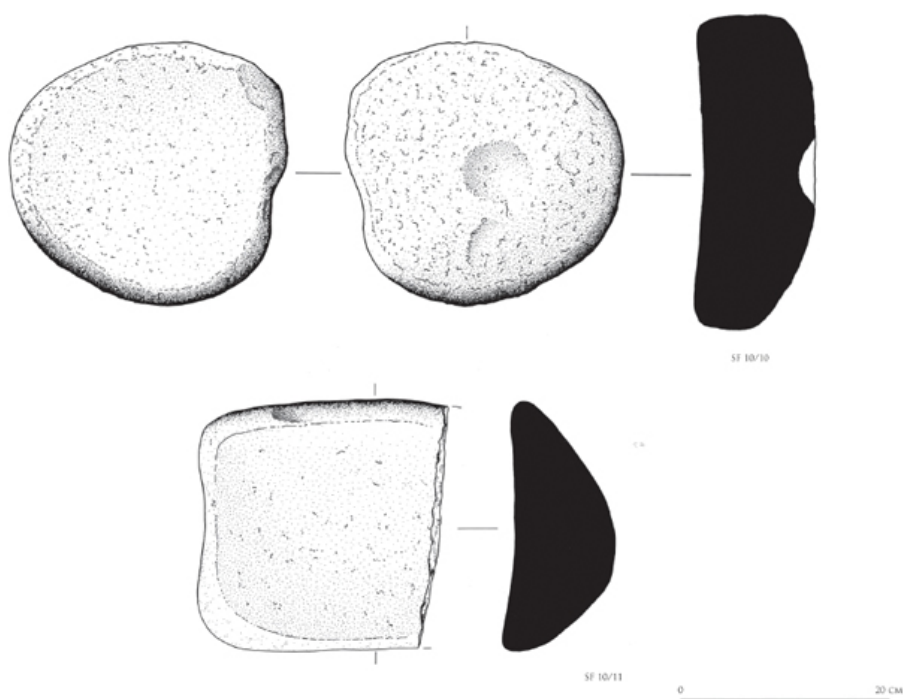
SF 10/13

SF 10/27



Illus 86. Cobble tools SF10/03, SF10/13 & SF10/27

The failure of the analysis to identify any surviving organic residues suggests that it is the stain of a dye or pigment rather than the dye itself which has survived and like that observed on painted pebbles, it has consequently proved impossible to analyse the constituents used (Richie 1972, 297).



Illus 87. Saddle quern SF10/10 & saddle quern SF10/11

Food processing tools

With the exception of SF 10/41, all of the rubbing stones were intact at the time of discard/deposition. In contrast, three out of five of the saddle querns are severely damaged (SF 09/13, SF 10/11, SF 10/25) ([Illus 87 & 88](#)). In each case it appears that the querns had sustained damage prior to their deposition, however, the friable condition of the stone makes this difficult to confirm.

With similar numbers of rubbing stones and saddle querns recovered the possibility of identifying pairs was expected but the friability of the surfaces and general condition of many of the saddle querns has prevented identification in most cases. Only one probable matching pair has been identified (SF 10/02 and SF 10/25), both recovered from context (604).

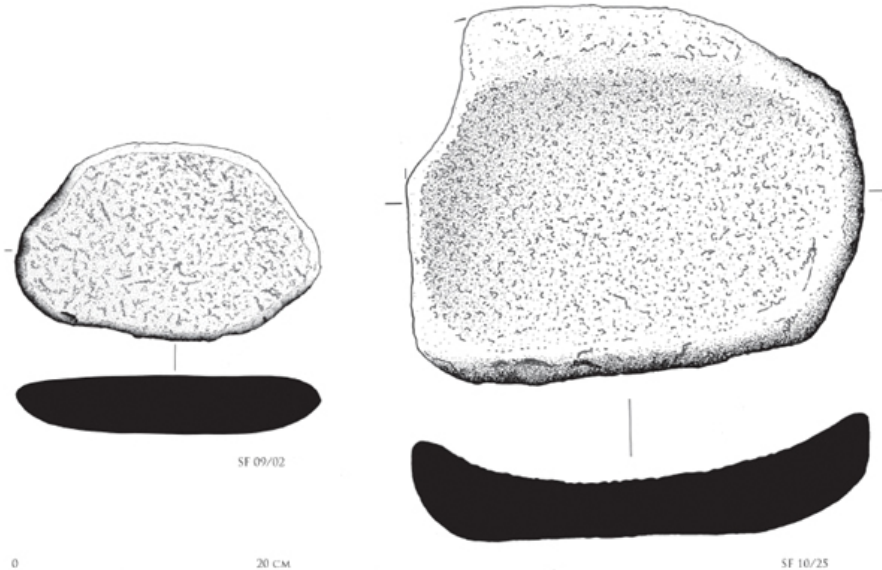
Secondary use was noted on two stones: cutting through the grinding face of rubbing stone (SF 10/06) is a distinct concentration of peckmarks indicating secondary use as a working surface and saddle quern (SF 10/10) has an off-centre shallow pitted hollow on the domed base. The purpose and function of this hollow is unclear; had the stone been otherwise unused an interpretation as a rotary quern roughout would not be out of place but the use of the stone as a saddle quern makes this proposition difficult to substantiate. It is more

likely that, with the grinding face making a stable base, the hollow was produced by use as an anvil or working surface.

Quartz-pebble cache

A spread of approximately 50 small, unworked, waterworn, white quartzite pebbles was noted during excavation (SF 07/05) at the interface between contexts (107) and (108). They covered an area approximately 0.50 m in diameter. Although these stones lacked evidence of wear from use as tools such as plough pebbles, the similarity of size, shape and colour suggests that they had been specifically collected and deliberately deposited on site, although the purpose of this deposition remains unclear.

The use of quartzite for special, possibly even magical purposes is well known throughout prehistory into early medieval times in Britain (Lebour 1914; Ritchie 1998, 176). Pure white quartz pebbles appear to have been favoured for such special depositions implying that it was the colour that was highly prized rather than the material which would otherwise be unremarkable. Recurring connections with early prehistoric funerary structures and individual burials has long been observed such as the inclusion of quartz pebbles within cist burials at Beech Hill House, Perthshire and West Water Reservoir, Peebles-shire (Stevenson 1995, 204; Hunter 2000, 132), the scattering of quartz round the kerb-stones of a cairn at Culcharron (Peltenburg 1972) and at Archarn Cairn 2 (Ritchie *et al* 1975, 19) both in Argyll and the link with kerb-cairns more specifically (Lynch & Ritchie 1975, 31). The association with burials and quartz pebbles is a long one, with the practice continuing into the early medieval period, such as that seen at Whithorn, Dumfries & Galloway (Chadburn *et al* 1997, 472–473). Such depositions are not restricted only to mortuary contexts (Lebour 1914). At Flag Fen and Bradley Fen, Peterborough, they were found scattered alongside the timber trackway with other offerings (Pryor 2001), presenting an evocative image of travellers deliberately dropping pebbles into the marsh at specific points on their journey, rather like today's practice of throwing coins into fountains for good luck.



Illus 88. Saddle quern SF10/25 & rubbing stone SF09/02

The general paucity of water-rounded quartzite pebbles elsewhere at Cults Loch 3 makes the cache below floor (108) particularly striking. It has not been possible to say whether the pebbles were sourced locally or from further afield but the similarity of size and colour of the stones suggests that they were deliberately selected and collected for deposition, perhaps as a foundation deposit prior to floor (108) being laid down.

Contextual analysis

Over 48% of the assemblage (15) was recovered from upper layers of cobbles (500) and decayed organic-rich material ((206), (505), (506), (601)) likely to represent conflated occupation material within a decay horizon. Here, cobble tools dominate (9) with pounders (SF 09/04, SF 09/07, SF 10/08) and combination tools (SF 09/03, SF 10/06, SF 10/13) being the most common type. Saddle querns (SF 10/10, SF 10/20) and rubbing stones (SF 09/01, SF 09/02, SF 09/18) are also present. Due to the decayed condition of these deposits it is difficult to interpret the significance of the location of the stones with any certainty but it seems likely that the stones were deliberately left within the structures and have become subsumed within the decaying organic structural material after abandonment. Macro-plant evidence and thin-section soil analysis from the earlier structures suggests that the interior spaces were kept fairly clean during their occupation implying that the stone tools from the site do not simply represent

discarded rubbish.

A further three stones, comprising a rubbing stone (SF 08/14), saddle quern (SF 10/11) and whetstone (SF 10/31), were unstratified.

The remaining 12 tools (39%) came from organic floor coverings and surfaces associated with the timber structures and contemporary with the early Iron Age occupation of the site (Illus 90). As with the upper conflation deposits just discussed, the objects associated with the structures are predominantly cobble tools (9), particularly grinders (SF 09/29, SF 10/03, SF 10/10) and combination tools (SF 10/04, SF 10/39). Only three food processing tools, rubbing stones (SF 10/02 & SF 10/41) and a saddle quern (SF 10/25), were recovered from an organic floor surface (context 604) and plant litter floor covering (context 622).

Coarse stone tools were recovered from all three identified structures; the majority (9) deriving from ST2 (Table 10b). These tools, which comprise rubbing stones, a single saddle quern and various single function and multifunction cobble tools are clustered around the central hearth implying activity zones relating to food processing and other activities within the building. Although not found together, a possible matching rubbing stone and saddle quern (SF 10/02 and SF 10/25) has been identified from a layer of decayed flooring (604) around the hearth foundation, H2. ST1 was associated with two tools: a grinder and a multifunction tool which comprises both abrasive wear and pitting, although the precise function of these items is elusive. In contrast to the other structures on Cults Loch 3, no cobble tools such as grinders or pounders were recovered from ST1 either hinting at a change in the nature of use of this later building or a variation in the way that finds were deposited. A single whetstone came from ST3, the latest of the identified structures. This fits in well with the evidence recently collated from a study of the context of whetstones from Iron Age sites in East Lothian which indicates that such tools are most common within later phases of occupation, particularly late/Roman Iron Age contexts (Hunter 2009, 148). It also indicates the use of metal blades; a component not preserved in the Cults Loch 3 assemblage. It is likely that these tools were *in situ* in the building at the time of abandonment. Whether these items were left on site due to practical reasons (eg difficulties involved in transporting large stone objects such as saddle querns or the expedient nature of cobble tools) or symbolic motivations (eg as closing deposits marking the end of the building's use) is difficult to ascertain. The purposeful placement of both saddle and rotary querns is well attested throughout the Iron Age (Hingley 1992, 32; Heslop 2008, 65–68) and

the damaged condition of a number of the saddle querns from Cults Loch 3 is of interest in this context as it is unlikely that such robust stones were accidentally broken. Detached edge fragments and damage to the grinding faces could indicate that they may have been deliberately slighted at the end of their life or on abandonment of the structures. A similar pattern of deliberate division and damage of the rotary querns from Cults Loch 5 has also been noted (McLaren, this paper). Although the deliberate breakage of cobble tools has been noted elsewhere (Hunter 2009, 148), this does not appear to have been a practice employed at Cults Loch.

Catalogue of coarse stone

To aid comparative analysis of the cobble tools, the classification system utilised at the Howe, Orkney (Ballin Smith 1994, 196), based on wear type, has been used. Abbreviations: D diameter, L length, W width, T thickness. The small finds numbering system used here indicates the year of excavation (eg '08' = 2008) followed by the find number given in the field (eg '08/01')

Food processing

RUBBING STONES (SEE ALSO SF 10/06)

SF 08/14 Plano-convex ovoid water-worn diorite cobble with naturally smooth rounded ends, gently curving sides and dark staining on one convex face from submersion in a peat-rich environment. The opposite face is rounded as a result of abrasion from use with an abraded bevelled facet at both rounded ends. The distinct polish and pitting of the grinding face suggests extensive use. L 248 W 156 T 51.5–60.5 mm. Unstratified. Found in 1986 by Jane Murray to the south side of promontory.

SF 09/1 Plano-convex ovoid water-worn quartzite cobble with smooth rounded abraded edges and ends. Grinding face is flattened by abrasion. Bands of polished abrasion are present around the circumference and the face is slightly bevelled at the rounded ends. Wide rounded end with short band of peckmarks (16 mm × 62.5 mm). Surfaces homogeneously stained with red-brown iron pan. L 190 W 136 T 54 mm. Context 500, upper cobble layer over site.

SF 09/2 Oval plano-convex water-worn porphyritic diorite cobble with naturally rounded edges; oval area of one edge is flattened by a band of pitting (L 85 W 14 mm). The grinding face is convex, gently rounded on both axis, bevelled at rounded corners. Surface is smooth

and abraded with small regular pits produced as the result of minerals detaching during use. Band of polished abrasion around the circumference of the grinding face. L 174 W 155 T 50 mm. Context 500, upper cobble layer over site.

SF 09/18 Possible rubbing stone noted in the field as a 'flat, degraded rubber stone'. Not seen during specialist reporting. Context 505, decayed remains of floor coverings; N quadrant.

SF 10/02 Ovoid plano-convex diorite cobble with naturally round ends and gently curving edges, one of which is damaged. The grinding face is convex in shape but friable resulting in the loss of much of the original surface. Polished abrasion from use survives only in small patches. Possible pair to SF 25. L 234 W 101-177.5 T 46 mm. Context 604, organic floor surface; ST2.

SF 10/41 Plano-convex ovoid water-worn metabasite cobble, one naturally rounded end survives; the opposite end damaged. Large spalls from opposing corners of damaged end have been lost leaving a tapering blunt abraded spur. Both faces are naturally rounded and smooth, one with abrasion and light polish from use particularly at the remaining round end where abrasion extends onto rounded edge. Remaining L 149 W 139 T 57.5 mm. Context 622, plant litter floor covering; ST2.

SADDLE QUERNS

SF 09/13 Substantial ovoid granite boulder, surfaces friable throughout resulting in the loss of one edge; original width of stone is unknown. A natural rounded projection at one end (50 mm × 82 mm × 111 mm), now detached. One extensive face has a large oval dished abraded facet (180–270 mm) which is severely eroded. Only small patches of flattened abraded grinding surface remain towards the surviving rounded end. L 369 W 256 T 139-172 mm. Context 512, amorphous organic matrix; N quadrant.

SF 10/10 Sub-circular plano-convex granite boulder with rounded friable surfaces and edges. One face is dished with patches of abrasion and pitting from use. The opposite face is gently rounded with an off-centre shallow circular pitted hollow (52.5 mm × 66 mm, 16 mm deep). Distinct peckmarks are visible; no evidence of smoothing of facet through extensive wear suggesting light use as an anvil or mortar. Alternatively, the peckmarked hollow could be an abandoned intention to perforate the stone (eg bun-quern upper stone). L 278 W 254 T 100 mm. Context 601, amorphous organic matrix; decay horizon.

SF 10/11 Sub-rectangular plano-convex granodiorite boulder with

naturally straight, rounded edges and naturally dished surviving end, one corner with recent surface damage; the opposite end lost. The grinding face is gently dished and pitted from use. The domed opposite surface is damaged at the apex (98 mm × 104 mm), perhaps deliberately to provide a more stable base. Remaining L 216–230 W 229 T 103 mm. Unstratified.

SF 10/20 Large kite-shaped greywacke (lithic arenite) slab, wedge-shaped in section with asymmetric rounded end which expands in width towards the centre of the stone then tapers to a blunt squared-end. Little evidence of modification to shape prior to use. Basal surface is uneven but provides a fairly stable base for working. Grinding face is dished with smooth, polished areas of abrasion around the circumference of the facet particularly towards the wide blunt end. L 356 W 72–233 T 36–75.5 mm. Context 601, amorphous organic matrix; decay horizon.

SF10/25 Large sub-rectangular water-worn granite/ granodiorite boulder. One rounded end and elongated edge survive; the opposite edge is severely damaged and one corner of the wide squared end has been lost. The grinding surface (L 351 W 195 Depth 35–44 mm) consists of a large oval dished hollow which covers the expanse of one face. Much of the abraded surface has been lost but patches of abraded lightly polished surface remain along the edges of the facet and in the surviving corner of the wide edge. The opposite surface is naturally gently rounded with no evidence of modification. Possible pair with rubbing stone *SF 10/02*. L 363 W 221–280 T 89 mm. Context 604, organic floor surface; ST2.

Cobble tools

GRINDERS (SEE ALSO *SF 06/3*, *SF 10/04*, *SF 10/13*, *SF 10/39*)

SF 09/29 Elongated ovoid water-worn greywacke (lithic arenite) cobble with angled flattened abrasion facet (15 mm × 31 mm) at one corner of one rounded end. L 113 W 59 T 22 mm. Context 521, plant litter floor covering; ST1.

SF 10/03 Ovoid water-worn quartzite cobble with well-developed bipartite abrasion facet at one rounded tip (53.5 x 57.5 mm). Opposite rounded tip has small flattened circular abrasion facet (22 mm × 25 mm). One face and edge have extensive iron-pan rootlet staining overlying oval patches and linear smears of dark-brown organic-looking staining. It is unclear whether these stains have been deliberately applied, are the result of use or are transfer marks from handling. Lipid analysis failed to detect any surviving organic material

to allow more precise identification. L 125 W 107 T 65 mm. Context 604, organic floor surface; ST2.

SF 10/14 Sub-square plano-convex quartzite-rich water-worn cobble. Oval faceted area of abrasion (23 mm × 28 mm) on one blunt rounded tip. L 88.5 W 88 T 61.5 mm. Context 601, amorphous organic matrix; decay horizon.

SF 10/15 Ovoid water-worn quartzite cobble with oval bipartite faceted abrasion (38mm × 21 mm) at tip of asymmetric blunt end; opposite end is unmodified. L 105 W 64.5 T 52 mm. Context 602, gravel floor surface; ST2.

POUNDERS (SEE ALSO *SF 09/03*, *SF 10/04*, *SF 10/39*)

SF 09/04 Ovoid water-worn diorite cobble with oval pitted area of wear at one corner (31.5 mm × 36 mm). Indistinct dispersed patches of pitting extend off from this main facet suggesting the tool was used at varying angles. L 83.5 W 92 T 68 mm. Context 500, upper cobble layer over site

SF 09/07 Elongated ovoid greywacke (lithic arenite) cobble, one rounded end with a well-defined oval peckmarked facet (31 mm × 21 mm), the opposite end is unmodified. Recent scratches and scars are present on once surface and both edges. L 181 W 55 T 39.5 mm. Context 506, amorphous organic matrix; N quadrant.

SF 10/07 Ovoid water-worn quartzite-rich cobble, one end significantly modified by large oval peckmarked facet (55mm × 93 mm); chipping around edge of facet suggests use with fairly vigorous force. L 103 W 103 T 68.5 mm. Context 601, amorphous organic matrix; decay horizon.

SF 10/08 Small oval plano-convex water worn greywacke (lithic arenite) cobble; surface is friable and eroded. Band of peckmarks present at wide blunt end (12 mm × 55 mm). Opposite rounded end lightly damaged. Recent scrapes on one face and rounded end. L 99 W 84.5 T 47.5 mm. Context 601, amorphous organic matrix; decay horizon.

SF 10/26 Irregular ovoid water-worn quartzite cobble with well-developed pitted facets at three corners (D: 36 mm, 37 mm, 44.5 mm) causing significant modification to the stone's original shape. Two wear facets on opposing corners extend onto the domed upper surface to form a narrow band (25–39 mm). L 81 W 81 T 65.5 mm. Context 609, plant litter floor covering; ST2.

SF 10/27 Ovoid water-worn granite cobble, one rounded end has off-centre oval pecked facet (23 mm × 32.5 mm); the opposite end is uneven and pitted but lacks concentrated wear. One flat face has a

linear longitudinal band of dark-brown organic-looking staining (14.5–65 mm) adjacent to the curving edge. Chemical analysis failed to detect any surviving lipids or organic traces to allow more precise identification of the residue. L 117 W 88 T 66.5 mm. Context 609, plant litter floor covering; ST2.

HAMMERSTONES

SF 09/17 Possible hammerstone. Not seen. Context 506, amorphous organic matrix; N quadrant.

SF 10/28 Flattened ovoid water-worn greywacke (lithic arenite) cobble, one narrow blunt end with bifacial fracture from use. Bifacial fracture scars also present on one elongated edge. Opposite rounded edge and end unmodified. L 142 W 75.5 T 27.5 mm. Context 609, plant litter floor covering; ST2.

WHETSTONES (SEE ALSO SF 09/03)

SF 08/11 Narrow elongated greywacke (lithic arenite) pebble, two faces heavily polished and stained through use. L 102 W 18 T 14 mm. Context 206, mixed spread of flooring material; ST3.

SF 10/31 Flat ovoid water-worn greywacke (lithic arenite) cobble with naturally rounded ends and edges, one end slightly damaged. One face is lightly dished and abraded from use. L 132.5 W 46.5 T 15 mm. Unstratified.

COMBINATION COBBLE TOOLS

SF 09/03 Fragment of an elongated water-worn greywacke (lithic arenite) cobble, one end flattened by an oval (25 mm × 31 mm) abraded facet; opposite end lost. Small circular concentration of peckmarks (D 8 mm) is present at the centre of one remaining rounded edge. The opposite edge has a flattened band of abrasion (W 10 mm) from use as a whetstone. Iron-pan rootlet staining and dispersed recent scratches are present on both faces. Towards the break surface on one face is a natural irregular oval depression. L 130 W 67 T 40 mm. Context 500, upper cobble layer over site.

SF 09/21 Ovoid water-worn quartzite cobble, one rounded end is significantly modified by faceted abrasion. Three distinct facets are present: two are flattened (49 mm × 81.5 mm; 21.5 mm × 44.5 mm), one is convex (46.5 mm × 72 mm) indicating the tool was used at varying angles. Small oval abrasion facet (23 mm × 26 mm) at opposite round end. Small circular pitted facet off-centre near apex of domed face suggesting expedient use as pounder (D 13.5). Iron-rich

water stain is present around the circumference. L 93.5 W 88 T 66 mm. Context 520, lower deposit of hearth foundation/flooring.

SF 10/04 Ovoid water-worn granite cobble with naturally rounded surfaces, one end and significant proportion of one face lost. Surviving rounded end and edge modified by wide rounded band of abrasion (W 37-46 mm) with distinct flattened facet at one end (37 mm × 46 mm remaining). Towards centre of damaged face is an oval pitted area (D 25 mm remaining) suggesting secondary use as pounder or working surface. L 80 remaining W 70 T 66 mm. Context 604, organic floor surface; ST2.

SF 10/06 Flat trapezoidal greywacke (lithic arenite) cobble, wide asymmetric angled end with rounded corners tapers towards blunt squared end. Both edges are naturally straight and smooth. The grinding face is gently dished with abrasion from use as a rubbing stone, abrasion and polish concentrating at the rounded corners of the widest end of face. Cutting through abrasion is an oval area of peckmarks which extend towards slightly curving edge indicating secondary use as a working surface. Further dispersed peckmarks are present towards the edges of the face. A large spall has detached from the opposite rounded face, perhaps a deliberate attempt to create a more stable surface during use. L 230 W 94-146 T 46 mm. Context 601, amorphous organic matrix; decay horizon.

SF 10/13 Quartzite-rich flattened spherical waterworn cobble with bipartite faceted band (W 52 mm) of well-developed abrasion covering three quarters of circumference; narrow more dispersed band (W 12.5 mm) encircles remaining portion of circumference. One convex smooth face with indistinct pitting at centre. Opposite face is flat and smooth with light polish, possibly the result of use as a smoother. Irregular shallow pitting at centre of face cuts through polish suggesting secondary expedient use as working surface. L 106.5 W 106 T 66 mm. Context 601, amorphous organic matrix; decay horizon.

SF 10/39 Ovoid water-worn quartzite cobble with faceted band of abrasion (W 16-52 mm) around circumference; more extensively worn at opposing ends (52 mm × 63.5 mm; 59 mm × 60 mm). Both lightly rounded faces severely pitted from secondary use as pounder or working surface (25 mm × 34 mm; 28 mm × 38.5 mm). L 78 W 73 T 60 mm. Context 634, sub-floor deposit; ST1.

OTHER

SF 07/05 Quartz pebble cache. Approximately 50 small ovoid water-worn quartz pebbles spread over an area 0.5 m diameter. The pebbles

averaged 50 mm in length and 40 mm in width. Context 107, discontinuous spread of fire cracked stone (108); ST3.

The chipped stone assemblage

Rob Engl

Introduction

An assemblage of 35 pieces of chipped stone was recovered from deposits on the crannog ([Table 11](#)). The entire collection was macroscopically examined and characterised. A complete database of the assemblage is available in the site archive but a selection of the material is catalogued below.

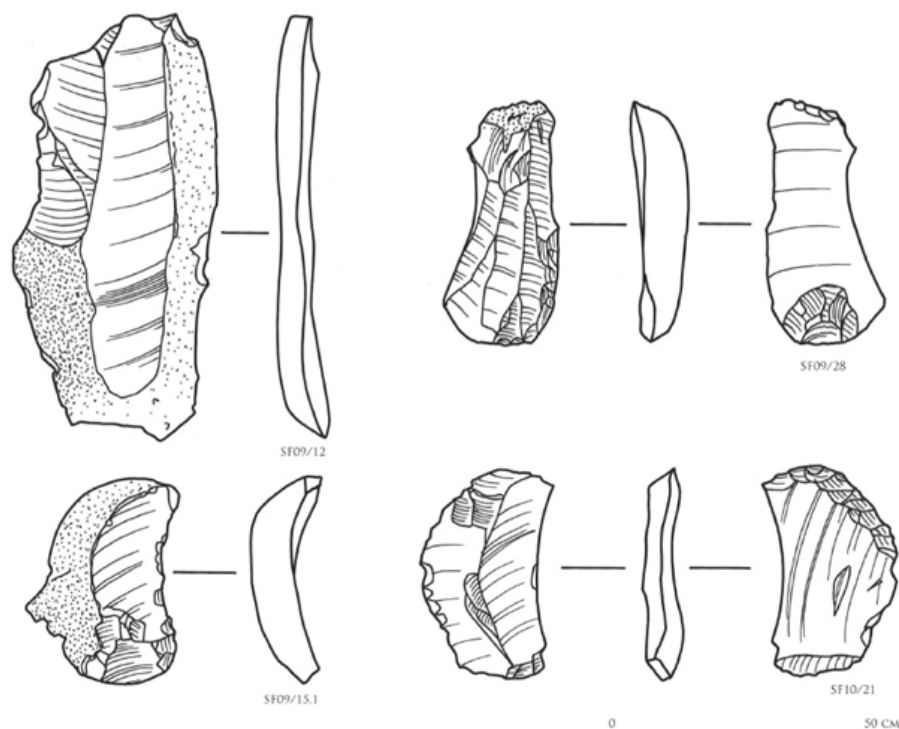
The assemblage is of local derivation and is dominated by flint (n. 32), with single pieces of chert, quartz and quartzite. The flint appears predominantly pale grey in colour, with a thick smooth cortex, and several of the artefacts are rolled and water-worn, so it is probable that the assemblage is derived from secondary, coastal deposits of Antrim flint. The flint is generally fresh in appearance with occasional cream blooms of patination. Only one artefact appears heat affected.

Secondary technology

Three modified tools in the form of an awl (SF09/12; [Illus 89](#)) and two side-scrapers (SF10/21 & SF09/28; [Illus 89](#)) were retrieved from the excavation. However, two other artefacts had been expediently pressed into service. The ‘bashed lump’ of chert (SF09/32) has use-wear visible along a single long edge. Similarly, the curved secondary flake (SF09/15.1; [Illus 89](#)) shows use-wear in the form of an acute, intensively ‘nibbled’ lateral edge suggesting the wear was caused by a concerted cutting action.

Table 11. The chipped stone assemblage by type

Type	Flint	Chert	Quartz	Quartzite	Total
Flake	8	—	1	1	10
Blade	2	—	—	—	2
Chunk	11	—	—	—	11
Split pebble	4	—	—	—	4
Utilised chunk	—	1	—	—	1
Platform core	1	—	—	—	1
Core fragment	2	—	—	—	2
Side-scraper	2	—	—	—	2
Utilised flake	1	—	—	—	1
Awl	1	—	—	—	1
Total	32	1	1	—	35



Illus 89. The lithic assemblage: awl SF09/12, side-scrappers SF10/21 and SF09/28, and curved secondary flake SF09/15

Primary technology

Debitage dominated the assemblage. Chunks (n. 12) and short squat flakes (n. 8) provided the majority of the artefacts. Together with the presence of both simple and crushed platforms this suggests that a

poorly applied hard hammer technique was the primary method of reduction. Two true blades were recovered both of which were parallel-sided.

A single, simple platform flake core (SF10/05) was recovered during the excavation together with two fragmentary examples (SF10/23 & 23.1). Four split nodules of flint were also recognised.

Distribution

A small amount of chipped stone was found in floor deposits within ST1 and ST3 but the bulk of the assemblage was retrieved either from the dumped deposits in the N quadrant or from the decay horizon. The N quadrant deposits are thought to be dumps of household rubbish while the decay horizon contains the highly humified remnants of *in situ* floor deposits, so in both cases the lithic assemblage is also closely associated with settlement activity. This pattern of deposition contrasts strongly with that from other excavated crannogs, such as Buiston, Ayrshire where a small lithic assemblage was considered largely unstratified (Finlayson 2000, 143) and at Dorman's Island, Dumfries and Galloway, where the lithics were retrieved from the construction deposits of the crannog (Engl 2011, 93).

At Dormans Island, the small assemblage of lithic material exhibited a similar range of debitage and restricted formal tool types as that from Cults Loch 3. The construction deposits from which they were retrieved included quantities of beach or river cobbles and it was therefore argued that the lithic material had been accidentally included into these deposits from *in situ* coastal scatters of earlier prehistoric date (Engl 2011, 93). At Cults Loch 3, the distribution of lithic material within settlement deposits make it more likely that the assemblage directly relates to activities undertaken on the crannog and can therefore be considered of firm Iron Age date.

Discussion

Firm archaeological evidence for Iron Age flint working is often considered largely absent from the archaeological record (Saville 1981) and so the presence of flint on later prehistoric sites has almost always been viewed in terms

of 'residuality'. However, the work of Humphrey and Young (1999) has challenged this generally accepted interpretation by identifying a number of archaeological sites in England where a case could be made for continued, regular use of lithics into the Late Bronze and Iron Ages (ibid 57). Humphrey and Young have argued that the term 'residual'

was often too freely used as a simplistic ‘catch-all’ especially when discussing the complexities of site and assemblage formation. There should in effect be a greater specification and clarity as to how and what lithic material is residual from.

With a firm contextual base in place we are better placed to consider the assemblage on its own merits. Humphrey and Young (1999, 58–59) have suggested a range of attributes for the identification of later prehistoric lithic assemblages based on evidence from a selection of land based sites from Southern and Eastern England. The attributes include;

- Use of localised raw materials
- Small assemblage size
- Simple core technology employing hard hammer technique and direct percussion
- Lack of knapping skill as shown by: high instance of chips/chunks, wide striking platforms, short squat flakes, high instance of step and hinge terminations, irregular core morphology
- Restricted range of formal tool categories
- A predominance of secondary and tertiary flakes

The assemblage from Cults Loch 3 displays all these attributes and would therefore seem to constitute an Iron Age lithic assemblage. The utilitarian and expedient feel of the material most probably relates to the highly restricted role of lithic material in domestic contexts in the Iron Age, a process which began in the Middle Bronze Age with the decline in use and range of lithic tools as they were required to fulfil fewer symbolic and socio-economic functions. This in turn led to a focus on localised procurement and simpler more expedient processes of manufacture (Herne 1991, 67; Edmond 1995, 184–186).

Lithic material has been retrieved from many 19th century crannog excavations such as Lochlee, Ayrshire (Munro 1882, 108–109) and Friars Carse, Dumfriesshire (ibid 174), but secure contextual information is lacking. The Cults Loch 3 material therefore presents a small, yet important assemblage with strong contextual associations which supports the thesis that flint working continued in later prehistory.

Selected catalogue of lithics

(dimensions in mm)

SF10/21 (Illus 89) Sidescraper. Pale grey patinated flint. 40 × 22 × 6. Regular flake with abrupt retouch applied to the left lateral edge. Retouch confined to the distal end of the flake. Probable use-wear is

visible along the right lateral edge. (601)

SF09/32 Utilised chunk. Cream coloured flint. $53 \times 45 \times 34$. Large 'bashed lump' of flint with a single edge bearing utilisation scars. (516)

SF09/10 Blade. Cream coloured flint. $33 \times 10 \times 3$. Small regular blade with some possible use-wear in the form of 'nibbling' along both lateral edges. (505)

SF10/05 Platform flake core. Grey coloured flint. $30 \times 40 \times 20$. Single simple platform with several large flake removals on flint chunk. (604)

SF09/15 (Illus 89) Secondary flake. Grey coloured flint. $40 \times 22 \times 12$. Curved shape with simple platform and evidence of several previous flake removals on the dorsal face. Evidence of possible use wear in the form of 'nibbling' along the right lateral edge. (506)

SF10/23 Platform core fragment. Grey coloured patinated flint. Single simple platform with several small flake removals made on flint chunk. Platform also shows crush marks and several step fractures. (601)

SF10/23.1 Platform core fragment. Grey coloured patinated flint. Single simple platform with several small flake removals made on flint chunk. Platform also shows several step fractures. (601)

SF09/12 (Illus 89) Awl. Grey coloured flint. Awl made on large secondary blade. The blade has been notched by abrupt retouch on the proximal right lateral edge creating a working point. Fine semi-abrupt retouch has also been applied to the medial segment of this edge. Probable usewear in the form of 'nibbling' along left lateral edge. (502)

SF09/28 (Illus 89) Side-scraper. Grey coloured flint. The side-scraper is made on a secondary platform rejuvenation flake showing several previous removals. Abrupt regular retouch applied along right lateral edge. (516)

The burnt clay

Dawn McLaren

Small amorphous burnt clay fragments were recovered during soil sample processing from five contexts across the site: contexts 202, 206, 209, 215 and 516 (peat-rich deposit). Each sample consists of fragments weighing less than 2 g. Further pieces of fired clay were noted during thin-section soil analysis in samples from contexts 225 (unit 2 in K08.1) and 513 (unit 2 in M09.2).

The size and condition of these pieces precludes any firm

identification of their original form but they may well derive from degraded fragments of hearth lining, daub, pottery or fired clay objects such as loom weights or spindle whorls. Although it has not been possible to closely identify what these pieces of burnt clay originally derived from their presence on site is significant due to the paucity of later prehistoric ceramic finds from Wigtownshire and SW Scotland as a whole. No hand-retrieved pot sherds or pieces of burnt clay were recovered from the crannog which would have been expected had the occupants of the buildings been in the habit of using ceramic objects and allowing any broken pieces to remain within the structures during occupation. The lack of ceramic objects from the crannog gives the impression that burnt or fired clay items were not used at Cults Loch 3. Yet, when we consider that the buildings appear to have been kept fairly clean and free of day-to-day detritus, the lack of hand-retrieved ceramics is not unsurprising. These small fragments of burnt clay from samples take on a new significance as they suggest that the absence of pottery sherds and objects of fired clay from the crannog is genuine and not the result of unfavourable depositional conditions.

Synthesis of the material culture from Cults Loch 3

Dawn McLaren

Context and distribution

Artefacts were found in association with all three structures, with a further dispersed group of objects coming from the Phase 3 deposits in the N quadrant ([Illus 90](#)). The distribution of the artefacts will be discussed by structure.

Phase 2; ST1

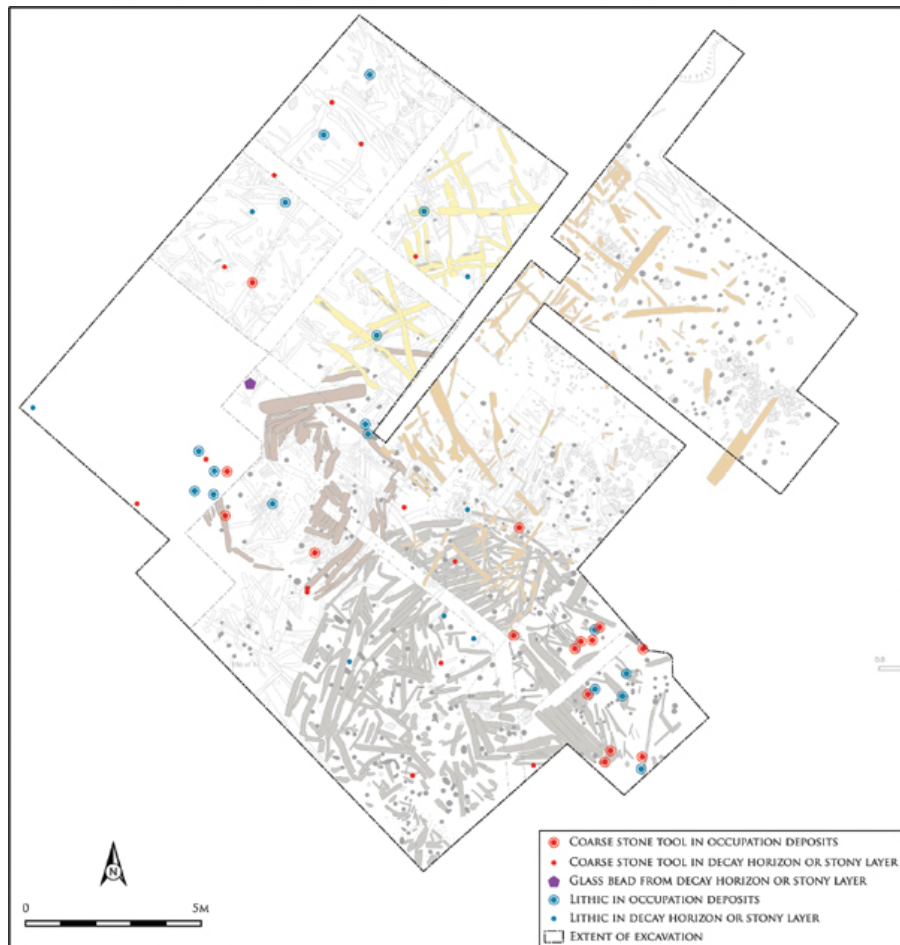
Early deposits within ST1 comprise a combination cobble tool displaying use as a grinder/pounder (SF 10/39) which appears to have been placed or incorporated within a layer of occupation debris (634) immediately overlying the foundation mound of gravel (627) of the structure.

Two struck lithics, a bipolar chunk of flint (SF09/24) and a flint flake (SF09/26) were closely spaced within plant litter floor material (521) to the north of Hearth 1. A similar cluster of struck lithics (SF09/20, SF09/32, SF09/30, SF09/31 and SF09/34) as well as a combination cobble tool showing evidence of use for grinding and

pounding (SF09/21) and a grinding tool (SF09/29) were found to the west of the hearth. These clusters of stone tools suggest two well-defined domestic activity areas contemporary with the occupation of the structure. This debris is undoubtedly related to activities undertaken around Hearth 1. Two further finds from later conflation deposits reinforce this pattern of deposition: a rubbing stone (SF09/01) was found amongst the stony layer (500) within the same vicinity of the group of tools just described and slightly further to the SW of this a stone pounder (SF09/07) was recovered from the decay horizon (506).

Phase 3; ST2

Four clusters of artefacts, to the NE, E and SE of Hearth 2 were recognised during excavation and are likely to represent discrete working or activity areas. These comprise an almost linear spread of stone tools to the NE of the hearth dominated by prosaic, general purpose cobble tools including two pounders (SF10/26 and SF10/27), a grinder (SF10/29) and a hammerstone (SF10/28) as well as a split nodule of flint (SF10/22). A few metres south, positioned immediately to the E of the hearth is a closely-spaced pair of tools consisting of a stone grinder (SF10/15) and a struck lithic (SF10/16). A third spread of tools lies further to the E comprising two flint tools (SF10/19 and SF10/37) and a rubbing stone for grinding grain (SF10/41). To the SE of the hearth is a group of tools from the final floor surface (604) which include a rubbing stone (SF10/02), grinder (SF10/03), combination cobble tool (SF10/04) and a flint core (SF 10/05).



Illus 90. Distribution of artefacts on the crannog. Those artefacts which are contemporary with the use of the structures are circled. All those found in the decay horizon are not circled

A saddle quern (SF10/25) from (604) lies just N of the hearth but further out from the other clusters of tools.

Phase 3; N quadrant deposits

Despite the large number of objects recovered from this area during excavation, only six finds were recovered from well-stratified Iron Age contexts. These consist of a flint awl (SF09/12) which was found amongst dumps of hearth and cooking debris (502) in the N corner of the N quadrant. A granite saddle quern (SF09/13) came from amorphous organic deposit (512), immediately to the N of ST1 within N quadrant and four struck lithics (SF09/08, SF09/14, SF09/23 and SF09/33) were spread out across this area amongst amorphous organic deposits and gravel rich layers (501, 510, 516) interpreted as occupation material deliberately removed from the adjacent structures

and discarded out with the buildings.

Phase 4; ST3

Only three modified artefacts were found in the vicinity of ST3 but none of these items can be associated with the occupation of this building with any confidence. A fragment of flint debitage (SF08/08) and fragments of two shale bangles (SF08/06) were recovered from topsoil; the debitage from near the central area of the defined structure and the shale from the easternmost extent of the excavated area of this proposed building. Both are likely to relate to Iron Age activity in the vicinity but cannot be confidently associated with this specific structure. Similarly, a whetstone (SF08/11) came from the decayed floor surface (206) at the interface with ST2. The location of this artefact on the boundary of two structures makes it difficult to be sure whether the whetstone relates to the occupation and use of the ST3 or was an earlier artefact from ST2 which had been incidentally incorporated within later material.

The paucity of artefacts found in association with ST3 is in marked contrast to the other structures investigated where distinct clusters of tools were found in close proximity to the central hearths. A gap in the distribution of finds from the later decay horizon deposits in the area overlying ST3 mirrors this pattern and implies that the absence of tools and other artefactual material from within and around this structure is genuine. When this difference in artefact distribution is considered alongside the structural evidence, which suggests that the construction methods used in this building were quite distinct to that of ST1 and ST2, it suggests that the activities undertaken within this structure were different to that of the other buildings where evidence for everyday domestic activities predominates.

The decay horizon

A significant proportion of the stone and struck lithic artefacts come from these amorphous layers of decayed organic material which represent degraded occupation debris and structural elements. In the vicinity of ST1, a struck flint (SF09/6) and a stone pounder (SF09/07) were found. An early Iron Age blue and white glass bead (SF09/19) was recovered in deposit (517) which lay immediately over (511), the final surface in ST1 so it could be associated with late activity in that structure. Two flints (SF09/10, SF09/16), two granite rubbing stones (SF09/02, SF09/18) a combination cobble tool (SF09/03) and a hammerstone (SF09/17) all come from the N quadrant but form no

distinguishable concentrations.

Around the area overlying ST2 was a further scatter of artefacts, irregularly spread across the area overlying the NW quadrant of the structure. These include three struck lithics (SF10/21, SF10/23, SF10/32, SF10/34) and a number of coarse stone tools comprising a rubbing stone/ working surface (SF10/06), two saddle querns (SF10/10, SF10/20), a cobble grinder (SF10/14), two pounders (SF10/07 and SF10/08) and a combination cobble tool (SF10/13).

A wide spread scatter of lithics (SF07/02, SF 07/03, SF07/04, SF09/10, SF09/15, SF09/16, SF09/28, SF09/35) came from a variety of decay horizons and conflation deposits across the excavated area and are not shown in [Illus 90](#).

Unstratified

Unstratified finds from the site were few but consisted of a rubbing stone (SF09/01), a saddle quern (SF10/11), a pounder (SF09/04) a whetstone (SF10/31), a fire-cracked cobble (SF09/05) and struck flint (SF07/01, SF08/8). A further object, an iron tapering shank, possibly from a nail (SF08/7) came from topsoil and may be modern. A rubbing stone (SF08/14) was found on the edge of the loch to the south of the crannog prior to excavation.

Discussion

The artefacts from the crannog form a small group of largely prosaic items consisting of a limited range of worked wooden containers and board fragments of larger composite objects, several grain processing tools in the form of rubbing stones and saddle quern fragments as well as a restricted range of cobble tools and struck lithics. In addition, two small fragments of worked shale, a glass bead and some small abraded pieces of burnt clay were recovered.

Although the artefacts from Cults Loch 3 are neither rich in number nor in the types represented, the assemblage as a whole provides a valuable insight into the day-to-day activities taking place at the site. The majority of items are directly related to everyday subsistence tasks and activities undertaken on the crannog during its occupation, namely the processing of grain into flour for cooking and other tasks centred around the hearths, as indicated by the distribution of cobble tools and worked flint. As well as activities relating to food processing, several tools hint at the working of animal skins, particularly by the presence of several stone tools which are covered in dark staining, plausibly from animal fats transferred onto the stones from use as hide

rubbers, and the recovery of at least one flint awl and side-scraper which may also have been used in the preparation of hides.

The discovery of the small fragments of burnt clay is a testament to the benefit of a rigorous sampling strategy for maximising artefact recovery as it would have been near impossible to spot in the trench. The find is an important one as no hand-retrieved ceramics were present on the crannog, emphasising the aceramic character of later prehistoric domestic activities in the southwest.

Despite the largely prosaic character of the assemblage and the local materials that they were produced from, a few notable finds stand out which highlight the significance of craft activities, networks of exchange of raw materials, commodities and ideas and the importance of personal ornamentation during the Iron Age. These include two shale fragments; one representing a fragment of finished bangle of unusual form and a flake from an unfinished bangle. The unfinished example is particularly important as it provides valuable evidence for occasional on-site shale working and, in particular, the manufacture of bangles. The shale used in the production of these bangles would not have been locally available suggesting that part-worked roughouts or blocks were brought to site deliberately for working. The recovery of only two fragments indicates that this was not a large-scale or longlived enterprise. But the evidence for bangle manufacture at Cults Loch 3 compliments the broader picture of the use of shale and lignite ornaments from other crannog sites and from the southwest of Scotland more generally.

A further significant item is a single large blue and white glass bead found within a layer of conflated decayed organic material. Analysis of the wear on the surface of the bead suggests that it was originally part of a necklace although whether the other beads were also of glass will remain a point of conjecture.

Neither the shale bangle fragments or the glass bead are in themselves rarities in a later prehistoric context yet the limited distribution and unusual occurrence of such items on Iron Age sites in southwest Scotland argue against them being commonplace ornaments. They were likely sought after items both because of their decorative qualities and as well as the unusual material they were produced from. An increase in the occurrence of items of personal ornament and decoration during the later Iron Age has been noted previously (Armit 1997, 252–253) and is thought by some to be linked with a growing concern with emphasising aspects of individual identity (Hill 1997). The chronology of occupation at Cults Loch 3 is significant in this respect as it implies that the use of jewellery as an

expression of identity and status noted in the later Iron Age had its roots much earlier than that noted in other areas of Scotland.

The recovery of several quernstones from a later prehistoric domestic site is not unexpected but the depth of stratigraphy at Cults Loch 3 affords a unique opportunity to understand the context of their deposition in a way not readily available on terrestrial sites. What is clear from the context of many of the finds is that the stones were deliberately left behind inside the structures at the time of their abandonment. Whether the discard of these tools was simply due to pragmatic reasons involving the difficulties of transporting large stones which could be easily procured or produced elsewhere or for more symbolic motivations is opaque. But at Cults Loch 3, several of these large stone tools were damaged or fragmentary at the time of their abandonment, a condition which cannot simply be explained away as wear and must be accepted as a deliberate act to render the stones functionless. Add to this the evidence for the deliberate deposition of fragmentary wooden containers and an unused wooden ard share under the floor of one of the timber structures, a tool so fine that it is unlikely to have ever been capable of functioning as an agricultural implement, and a picture starts to emerge of a community who repeatedly use objects familiar to them and the domestic activities that would have been part of their day-to-day life, to signal the beginning and end of the life of individual structures, inextricably linking the lifecycle of the buildings with artefacts symbolic of the cultivation of the land and the harnessing of agricultural resources.

2E THE STRUCTURAL TIMBERS

Introduction

Timbers found in the uppermost layers of the crannog, in the decay horizon, were in poor condition, the original surfaces lost and the wood structure so spongy and fragile that the overall morphology of the timber was not apparent. It was often difficult to discern whether a gap was actually a gap or the remains of a joint. A handful of horizontal oak timbers had survived just under the topsoil but even these were so decayed that it was difficult to be certain of the type of conversion. Frequently, non-oak timbers that initially appeared to be a small horizontal component lying on the surface of the crannog turned out to be stakes, the upper parts of which had gradually bent over as decay proceeded ([Illus 12](#)). Below the level of the decay horizon, preservation was much better and the tips of many stakes still bore clear toolmarks, even though their upper ends may only have survived either as tufts of heartwood, in the case of oak stakes, or as orange-brown smears in the case of non-oak stakes.

All oak timbers were sampled because they provided the best opportunity to dendro-date the site, but only those non-oak timbers which were either well-preserved, or displayed interesting carpentry details were sampled. Slices from a representative sample of both horizontal and vertical components were taken for both species identification and dendrochronology. In all, 275 wood components were sampled and/or recorded, of which 258 were identified as to species, and 128 were analysed dendrochronologically. The species composition of the assemblage was as follows; alder 66%, oak 28%, while hazel, willow and birch account for the remaining 6% ([Illus 91](#)).

Vertical components

As discussed above there is very little surviving evidence on which to assign stakes to specific structures or contexts so they are treated here as one assemblage. In terms of species composition 60% of the stakes were alder, 33% were oak, 6% were hazel, and there was a single willow stake ([Illus 91](#)). There was a large variation in dimensions which may relate to difference in function; diameters varied from 0.07 m to 0.29 m, although the majority of the stakes were under 0.20 m,

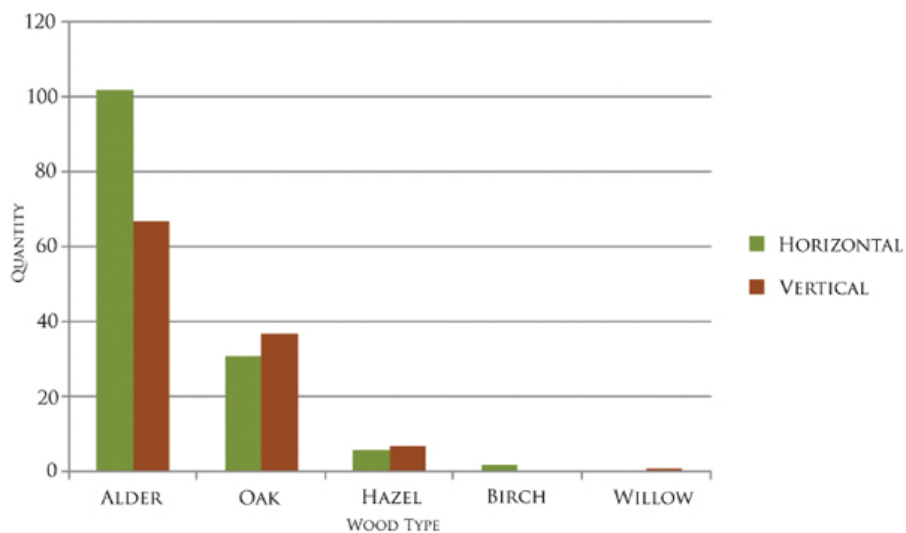
and only three stakes greater than this diameter were recovered. Surviving lengths varied from 0.35 m to 1.8 m (T207 was the longest stake recovered). The stakes were invariably roundwood logs axe-dressed to a sharpened point. The only recorded exceptions are T934 and T949 which have been fashioned from a quarterlog of oak, while T938 may have been fashioned from a half-log. Most of the stakes were probably fashioned from untrimmed roundwood for immediate use but there are several examples which may have been fashioned from re-cycled timber. For instance, the oak stake, T67 has a notch, 70 mm deep and 30 mm wide, crudely cut out just above its tip, which may be the remnant of a peghole from an earlier function ([Illus 92](#)).

The other possible example of recycled timber is T106 ([Illus 93](#)). It is a large alder roundwood stake 0.22 m in diameter and at least 1.23 m long, although the tip was not recovered. At the upper end are three oval holes in a row spaced 0.4 m and 0.35 m apart. The holes are straight-sided and flat-bottomed in profile and of similar dimensions, between 75 and 90 mm in depth and 60–70 mm by 50–56 mm across. The holes might relate to its function as a stake but none of the other neighbouring stakes had reciprocal holes into which horizontal elements might have been fastened.

Two of the alder stakes had forked upper ends. T916 and T956 were between 0.12 and 0.16 m in diameter and had collapsed breaking off at ground level, the forked end lying horizontal ([Illus 94](#)). The most complete of them was T916 which was at least 1.85 m high. The arms of the fork were asymmetrical, those on T916 being 0.8 m and 0.3 m, while those on T956 were 0.50 m and 0.20 m.

Horizontal components

The species composition of the horizontal timbers was similar to that of the stakes; 76% alder, 19% oak, 4% hazel, and two examples of birch ([Illus 91](#)). These figures include representative samples from bundles of hazel brushwood (212) and small alder branchwood (T917). The horizontal timbers varied from small branches 0.10 to 0.12 m in diameter to large logs mostly up to 0.32 m in diameter. The largest complete timber found on the crannog was ([Illus 101](#)), an oak log 0.40 m in diameter and 2.75 m long, which forms one side of the hexagonal timber framework in ST1. The original length of the logs was often difficult to ascertain because their ends had decayed but many had survived to lengths of between 2 m and 3 m. At 3.84 m T909 was the longest complete timber recorded on the crannog (see below). Where the ends had survived they had either been chopped to a roughly square profile, or had been shaped to a blunt point.



Illus 91. Species composition of the waterlogged structural timbers



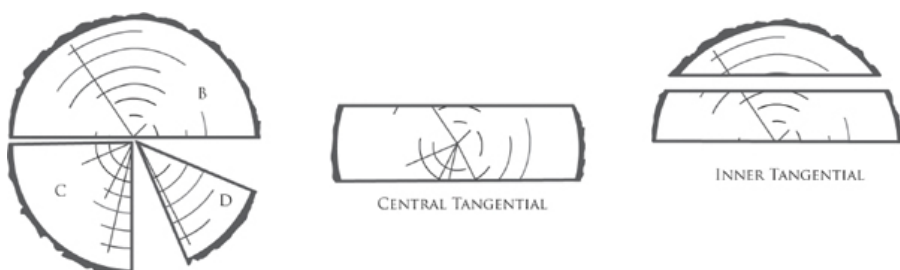
Illus 92. Oak stake T67; the notch across its tip may be the remnant of a peghole, indicating that the stake was fashioned from recycled timber



Illus 93. Alder stake T106 (solid mesh derived from laser scanning); the three holes along its length may indicate the use of recycled timber



Illus 94. Forked alder timber T916 in situ



Illus 95. The types of timber conversion observed at Cults Loch 3: A = half-log; B = quarter-log; D = radially-split plank.

The shaping of the ends of the timbers aside, only a small proportion of the horizontal timbers (21.5%) displayed any other evidence of woodworking; the evidence is presented below.

Conversion

The majority of the horizontal alder timbers were undressed roundwood logs, often with bark still attached. Only a small proportion (12.5%) of the recorded timbers had been converted beyond the round (*Illus 95*). A few of these were alder logs that had simply been split in half, but mostly these were oak planks which had been fashioned from chords split off the log (outer tangential) or from half-logs, the curved sub-bark surface of the log being dressed flat (inner tangential). There were only two examples of radially-split oak

planks found on the crannog. A group of alder planks (see below) had been fashioned by cleaving off chords on opposing faces of the log, leaving a roughly rectangular section from across the centre of the log (central tangential).

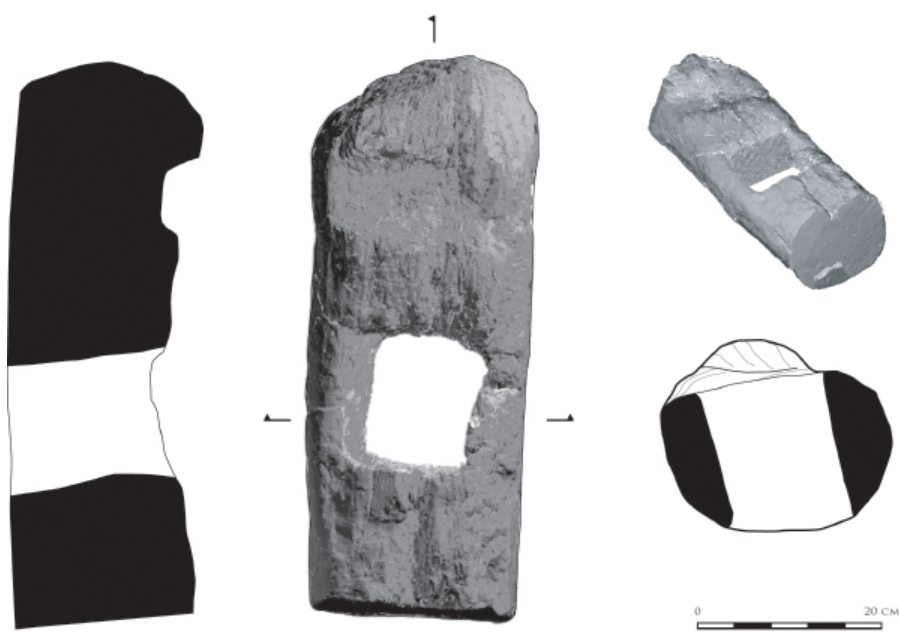
Joints

Only a handful of timbers displayed clear evidence of jointing, with some of the joints still *in situ*. (644) consisted of a number of oak and alder stakes, ie T947, which had been mortised into a long horizontal alder timber, T955 (Illus 38). The mortise in T955 into which T947 had been inserted was very decayed and it is likely that T955 originally had multiple mortises along its length. T909, a half-log of alder is probably part of the same structure. Both ends had been shaped to a blunt point and there was a roughly rectangular mortise at each end. The best preserved of the mortises was 0.18 m by 0.12 m across. A stake was found *in situ* through the decayed mortise.

Only two other timbers displayed mortises, neither with stakes *in situ*, so these may be re-used timbers. T2 and T20 displayed a similar combination of features at the one surviving complete end (Illus 96 & 97). Both had ends which had been shaped to a blunt point, large square mortises (0.23 m and 0.17 m square respectively) and a shallow notch cut across the width of the timber between the mortise and the pointed end. The notches were rectilinear in profile; that on T20 was 0.08 m wide and 40 mm deep. The purpose of the notch is not obvious; it could possibly have housed a timber which was then braced against the stake but the two joints seem too close for the bracing timber to have functioned successfully.



Illus 96. Horizontal alder timbers *in situ* with mortises and notches: a) T20; b) T2



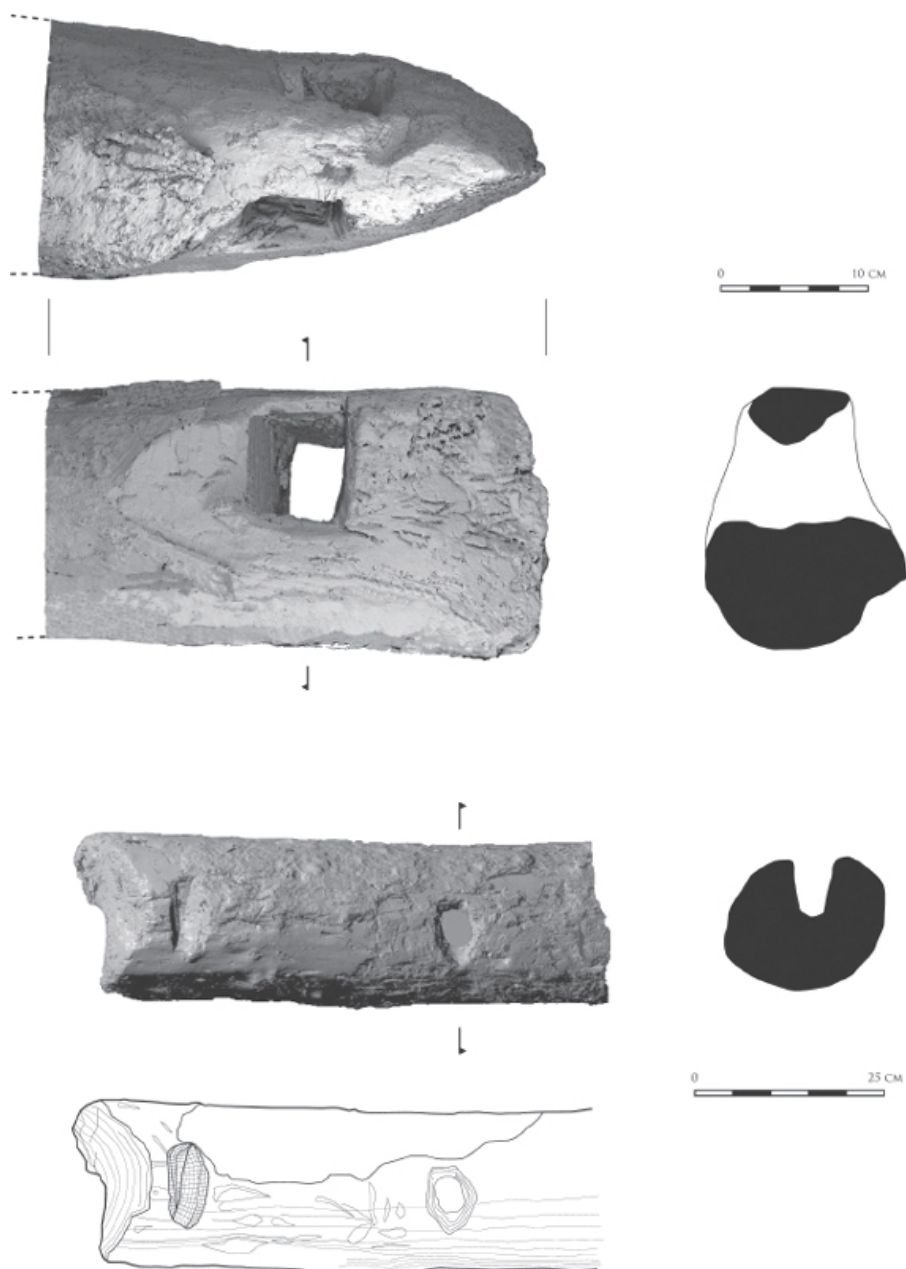
Illus 97. Laser scan of surviving end of T20 showing mortise, notch and shaped end

Other horizontal timbers may have also been mortised but the joints have not survived; the position of stakes at either end of the alder log, T183 under ST3 suggests that it may have been pinned in place through mortises. There were also stakes along its sides. T2, which was over 3 m long, was also pinned in place by a series of small stakes along either side ([Illus 20](#) & [96b](#)).

Sub-floor (624), ST2

Some of the large alder logs used to construct sub-floor (624) displayed a range of features, none of which were compatible with their use in a sub-floor ([Illus 26](#) & [32](#)). The features they display were all visible on the upper surfaces of the logs. One end of T34 has been axe-dressed to a chisel-edge, creating a large facet on the upper and lower surfaces, and a rectangular mortise has been cut through this facet ([Illus 98a](#)). The mortise has been cut through from both surfaces so that it is roughly hourglass-shaped and irregular in size, and the toolmarks in the mortise are fresh, as though it has not been used. Some 0.9 m from this shaped end is a deep notch cut across the log which has subsequently split the log in two. T36 is a half-log, the bark still *in situ* on parts of the log. One end has been chopped off at a steep angle and just behind this end is an irregular rectangular notch, 30 mm deep with a V-shaped profile ([Illus 98b](#)). Approximately 0.46 m from the chopped end is an oval hole, 75 mm by 55 mm which is 90

mm deep. Knifemarks are visible around the oval hole, possibly from marking out its position. Another more poorly-preserved oval hole lay some 0.40 m further along the log. One end of T37 had been shaped in a similar way to T34, the large facet facing upwards *in situ*. A roughly square hole had been cut through this end, penetrating one half of the timber; this was not visible on the surface. Mid-way along the log a shallow notch had been cut across the log. Both ends of T38 had been squared and some 0.18 m in from one end a shallow notch had been cut across the log.



Illus 98. Floor timbers: a. T34; b. T36 (solid mesh derived from laser scanning)

The chisel-shaped ends seen on T34, T36 and T37 may have been created to make a neat junction with other horizontal logs laid end to end to form the sub-floor, the chisel-shaped ends overlapping with each other.

Floor (519), ST1

Some of the timbers forming floor (519) also displayed a range of apparently redundant features ([Illus 23 & 24](#)). Of the 11 timbers sampled from this context eight were planks, the ends of which had either been chopped roughly square or to a blunt point by two facets. Two of the planks, T922 and T926 had roughly oval holes penetrating their thickness, and on either side of the through-hole on T922 were three roughly circular indentations forming a line along the centre of the plank.



Illus 99. Horizontal timbers in situ with notch: a. T932; b. T933

Notches

Some of the longer horizontal timbers displayed shallow notches which had been cut across the log and which were always visible on its upper surface. These were mainly found within ST2 (T6, T7, T9, T46 and three of the timbers in (624) described above) but two examples are associated with ST1 (T932 and T933; [Illus 20 & 99](#)). The notches were between 20 mm and 30 mm deep and 25 mm to 30 mm wide, and where the wood was sufficiently well-preserved, as on T6, it was possible to see that the notches had been fashioned by one downward chop and an angled chop. However, on T933 and T34 the cuts were of such depth that they had almost severed the log in half ([Illus 99b](#)). The notches only ever occurred singly, and had been cut at right angles to the log. The only exception to this was T932 which displayed two notches cut at oblique angles across the log ([Illus 99a](#)).

A small branch was found lying in the notch cut into T37 ([Illus 100](#)); this may have been fortuitous but it does offer a possible explanation for these notches. If branches were inserted into the notches they could have acted as guides to position the bundles of branch and brushwood which were laid at right angles over the larger sub-floor timbers, ie (622/623) in ST2 and (212) in ST3 ([Illus 42](#)).

Timbers with offset through-holes

A number of the timbers displayed a very characteristic through-hole.

The holes were all roughly square and of similar dimensions, varying from 70 mm to 95 mm across, and were always positioned at one end of the timber. The holes were offset, penetrating only one half of the log, entering and exiting on the same side. They appear to have been cut from each end, giving the hole a characteristic hourglass shape. Examples include T901 ([Illus 101](#)), T41 and T45, all components of (630), the hexagonal framework in ST1, T963, one of the large timbers in the foundation deposits, (526), as well as T25 and T47, components of (642), the foundation surface of ST2. Two of the logs in the sub-floor (624) in ST2, T36 and T37, also displayed similar holes.



Illus 100. A small branch lying in the notch cut into T37

These holes were probably shaped with a small axe; a clear jamb-curve was visible in the hole through T37. It should be noted here that the only other examples of holes on timbers from Cults Loch 3, those on the horizontal log, T36 and the stake T106 (see above), are oval and are thus likely to have been fashioned with a knife or chisel; there is no evidence of the use of an augur for making circular holes.

These holes were found on some of the larger timbers on the crannog and their function might have been simply to make it easier to handle the timbers, dragging them on to the crannog with ropes

through the holes.



Illus 101. Horizontal timbers with holes. T901 in situ

Planking

As described above the planking used on the site had been converted in one of several ways. The alder tended to be made into planks by cleaving off chords on opposing faces of the log, leaving a chunky rectangular section across the centre of the log. Examples of this type of plank were found mainly in floor (519) in ST1, but also include T30 found in H2 ([Illus 32](#)) and T31 from floor surface (622) in ST2.

The oak planks were usually fashioned from chords or half-logs. These include T923, T927 and T964 from floor (519) in ST1, T962 and T968 in the causeway structure, the oak planks (508) and some of the oaks found in the uppermost decay horizon, ie T23, T172 and T300. The chord-converted planks were very fragile and often could not be lifted whole, if at all, splitting into small fragments along the medullary rays. This was very much the case with the thin oak planks, (626) used in and around the hearth structure H2 in ST2 ([Illus 32](#)). Some of the radiallysplit oak planks, (111), found near the access point onto the crannog were as much as 0.35 m wide but were also too fragmented to lift. These planks were notable as the only examples of radially-split timber on the crannog.

Woodworking debris

Only four pieces of woodworking debris were found on site, all in ST1. SF27 and SF36 came from (521), the primary floor surface in the structure, and both were alder. SF36 was an offcut 90 mm long and 90

mm wide cleft off the outer surface of a piece of roundwood, while SF27 was a large piece 110 mm by 90 mm chopped across the end of a length of roundwood. ST913 was a cleft oak offcut, 0.16 m long and 0.06 m wide, incorporated into the levelling surface (518), while T930 was a cleft alder splinter 0.35 m long and 0.05 m wide, incorporated into the floor surface (519). All had come from the trimming of roundwood, possibly to make stakes.

These are relatively large pieces of woodworking debris and it seems most likely that the small chips and offcuts usually associated with the axe-dressing of timber have simply decayed to the extent that they were unrecognisable.

Charred timbers

Of the structural timbers that were sampled and recorded 22 bore evidence of burning. None of the timbers were fully carbonised but mostly displayed patches of surface burning. Charred timbers are scattered across the site but there were concentrations in the re-levelling deposits represented by (519) in ST1 ([Illus 23](#)), and in the timber features in the N quadrant, (644) and (645). Perhaps not surprisingly, all the chord-converted oak planks (616) associated with the hearth foundation, H2 displayed signs of burning ([Illus 32](#)). On some of the timbers there was charring on both upper and lower surfaces, so either they were part of an upright construction when burnt, (ie T909) or they represent burnt timbers re-used on the crannog.

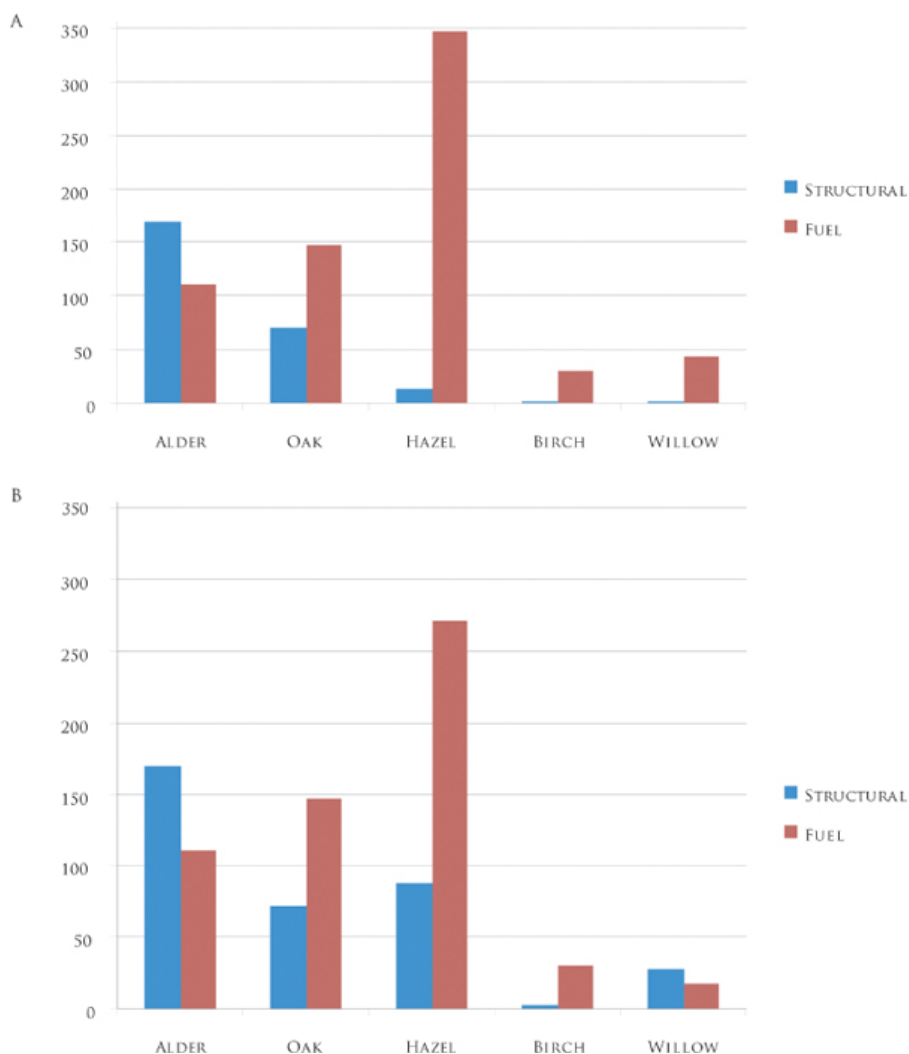
Discussion

There is only a small amount of evidence for carpentry on the crannog, the bulk of the timber being unmodified roundwood. This lack of evidence is probably partly due to the degree of decay on the site but it is in keeping with other later prehistoric crannogs which have been excavated. The only worked timber at Milton Loch 1 was a horizontal with two large square mortises at either end and numerous holes, which the excavator described as an old dug-out canoe re-used as a threshold (Piggott 1953, 136 & fig 6). A threshold timber is also one of the only worked timbers recorded from Oakbank crannog (Sands 1997, 48; Dixon 2004, 132 & fig 43); the timber displays a series of large holes, or mortises penetrating the timber at both ends, in between which are a line of small holes along the centre, so this may also have been a re-used timber, possibly a sillbeam.

The other worked timbers at Oakbank are two timbers with what

look like offset through-holes identical to those found on Cults Loch 3 (Dixon 2007, 257 & fig 2 & 3). Very similar crudely cut holes were also observed at the ends of several of the larger timbers in the substructure of the Loch Arthur crannog where they appear to have no structural function (Henderson & Cavers 2011, 111 & [illus 8](#)). While Dixon (2007, 257) hints at a complex function for the holes, it seems more likely that they were simply for dragging the timbers onto the crannog, as the excavators at Loch Arthur have suggested. At Cults Loch 3 the locations of the timbers bearing these offset holes do not suggest a structural function either (Figure 101). At Milton Loch 1 several of the horizontals in the substructure also appear to have holes at one end (Piggott 1953, fig 6) but the excavator does not comment upon them.

Few of the features in the assemblage can be paralleled in other excavated crannog assemblages, possibly because so few have been recorded and sampled to modern standards. Parallels for the notched timbers have not been found, either on other crannogs or on other wetland sites. Planking has not been recorded at Milton Loch 1, Oakbank or Loch Arthur but that may well be an issue of survival; there is plentiful evidence elsewhere that Iron Age builders fabricated and used planking. The builders of the Iron Age trackways at Corlea and Derraghan More, Co. Longford, Ireland used planks converted in the same variety of ways as seen at Cults Loch 3; half-split, radial, inner and outer tangential conversions were all present (O'Sullivan 1996, 327 & fig 427). O'Sullivan observed a correlation between the width of the plank produced and the type of conversion used, the half-split and tangential conversions producing the widest plank possible, while the radially-split planks were amongst the narrowest. This is in keeping with Taylor's observations that it is easier and less wasteful to radially-split timbers of 0.4 m diameter or less but larger trees are relatively easily split tangentially (Taylor 2010, 91). However, such a correlation is not so clear at Cults Loch 3; the inner tangential alder planks are amongst the smallest on the crannog, while the radially-split oak planks in (111) are as wide (0.35 m) as some of the outer tangential oak planks, ie T927 (0.38 m) and T32 (0.38 m). This may relate more to aesthetics than to the size of available timber. The (111) planks lay at the access point to the crannog and may have formed a barrier of horizontal plank walling on either side of the entrance (see [Chap 2a](#)); large radially-split oak planks may have been used here because they were more aesthetically pleasing.



Illus 102. Species composition for structural wood (waterlogged) and fuel (charcoal). In graph A the charcoal from [513] is included under Fuel. In graph B the charcoal from [513] is included under Structural

Mortised horizontal timbers are a common feature of many wetland constructions. Large mortised oak planks secured by stakes were recorded on one the Dowalton crannogs and interpreted as a possible breakwater (Stuart 1866, 117 & plate xi), while at Buiston and Lochlee crannogs large mortised oak timbers were used as radial bracing, tying the defensive perimeter to the internal substructure (Crone 2000, 106). The threshold timber on Milton Loch 1 had mortises at either end, as had the threshold timber at Lochan Dughaill, Argyll (216 & fig 1). At Cults Loch 3 two of the mortised timbers, T909 and T955, are *in situ* with stakes through at least one of their mortises. The other mortised timbers at Cults Loch 3, T2 and T20 are

ex situ but they are of very similar dimensions to the *in situ* examples so it is possible that they came from a construction to that represented by (644) (see [Chap 2a](#)).

Wood use on the crannog

At 66% of the waterlogged timber assemblage, alder was by far the most important species for building on the crannog. Oak was the only other important species, forming 28% of the assemblage, while hazel, willow and birch contributed only negligible amounts. There does not appear to have been any species which was preferentially used for specific structural functions ([Illus 91](#)); alder and oak were both used untrimmed as stakes, and planks were manufactured from both species, albeit that the method of manufacture differed between the species. However, a comparison between the species composition of the waterlogged structural timbers and that of the charcoal assemblage ([Illus 102](#)) suggests that certain species were favoured for particular functions.

Almost all the contexts in which charcoal was found were occupation deposits which also contained cooking and food processing debris (see [Chap 2c](#)). It thus seems reasonable to interpret the bulk of the charcoal in these deposits as representing fuel residues. Despite the presence of the charred timbers described above there was no evidence of any major conflagration on the crannog which could have contributed significantly to the charcoal content of these deposits. The exception is (513) which consisted almost entirely of a spread of carbonised roundwood fragments up to 0.17 m deep in places, and has been interpreted as the remains of a hurdle panel, possibly burnt *in situ*.

[Illus 102](#) suggests that alder was more favoured for building than for fuel whereas oak was used more as fuel than for building. Willow and birch are used more frequently as fuel but still contribute insignificant amounts. The major difference between the species composition of the waterlogged and carbonised assemblages lies in the quantities of hazel present. It accounts for 51% of the carbonised assemblage in contrast to only 5% of the waterlogged assemblage ([Illus 102a](#)). However, these figures include the spread (513) which represents the remains of a hurdle screen and which, as a structural component should be included with the waterlogged assemblage. The adjusted figures show that while hazel remained the most important fuel species on the crannog (47% of the total) it also had a significant role as a building material ([Illus 102b](#)).

Whether waterlogged or carbonised, the hazel always occurs as

small roundwood, usually no more than 20 mm to 30 mm in diameter and often much smaller (see [Chap 2c](#)), and thus probably the product of coppiced stools. It was probably used primarily in the construction of hurdle panels, for use as walling, internal screens and flooring. (212) was described on site as bundles of hazel roundwood but it may have been a hurdle panel used as flooring which was too decayed to recognise. In fact, decay may explain the absence of small hazel roundwood in the waterlogged wood assemblage, carbonisation being the only reason that (513) survived.

The hazel charcoal found in the fuel residues was also mainly small roundwood so coppiced stools probably also provided a fuel supply (unless they were burning old flooring and building materials?).

2F SUMMARY OF EVIDENCE FOR CONSTRUCTION AND OCCUPATION ON CULTS LOCH 3

Duration and continuity

The dendrochronological and radiocarbon evidence suggests that, with the exception of the early 2nd century BC episode, all the episodes of building activity on the crannog are not separated by any significant length of time, and occupation may have lasted no more than a half-century at most. Within that time at least two, possibly three structures were built, but there may have been more in the unexcavated fringes of the crannog.

There is some evidence that the crannog was not occupied continuously over the half-century. Several of the floor surfaces in ST2 display evidence which implies that the structure may have been uninhabited at times. The quantities of aquatic insects and weed seeds in floor (622) suggest the scenario that the structure became flooded and was subsequently abandoned, allowing weeds to colonise the floor surface. The surface of a later floor, (609) had become mixed with the overlying deposit, suggesting that it had been left exposed for enough time to allow for mixing by plants and animals, while the presence of large quantities of weed seeds again suggests a period of abandonment. Whether these events represent seasonal occupation or a longer, more episodic occupation, is unknown. The repeated cleaning and resurfacing of the floors observed in all the structures might represent a form of spring-cleaning when returning to the crannog on a seasonal basis.

Construction

The crannog mound had been constructed by laying down large logs in superimposed layers at roughly right- angles to the preceding layer, together with branches, brushwood and other organic materials which have subsequently decayed forming an amorphous peat-like matrix. Midden material was also incorporated into the build-up, implying the

existence of a settlement nearby. This type of construction is commonly referred to as a 'packwerk' mound and is typical of most Scottish crannogs where the foundations have been investigated (ie Buiston, Crone 2000; Ederline, Cavers & Henderson 2005; Loch Arthur, Henderson & Cavers 2011). The mound was approximately 34 m in diameter and allowing for decay and compaction it was probably never more than 1.5–2 m high. Oak and alder stakes were used to pin and contain the layers, forming a broad halo of stakes around the perimeter of the crannog. There is no clear evidence for a defensive perimeter around the crannog and the perimeter may have been defined by no more than a hurdle fence, with a more imposing screen of horizontal oak planks on either side of the entrance onto the crannog. A causeway of oak piles initially joined the crannog to the shore, around which sediments built up and it was eventually superseded by a gravel trackway kerbed with stone.

The expectation that crannogs would have a defensive perimeter has arisen out of the evidence from Early Historic sites like Buiston (and possibly Lochlee, Crone 2000, 106), Moynagh Lough (Bradley 1991), Lagore (Hencken 1950) and Ballinderry 1 (Hencken 1936), where clearly defined palisades and massive timber frameworks encircled the crannogs. In fact, very few later prehistoric crannogs display evidence for such a perimeter construction. Halos of stakes similar to that at Cults Loch 3 have been observed at Milton Loch 1 and Oakbank and in both cases have been interpreted as supporting a walkway or platform around the crannog (Piggott 1953, 143; Dixon 2004, fig 69), an interpretation which has become fossilised by both physical and drawn reconstructions (Cavers 2012, 175). The necessity for the encircling walkway at both these sites is predicated by the interpretation that a single large roundhouse occupied the entire footprint of the crannog (see below) and this is clearly not the case at Cults Loch 3. Nonetheless, it remains possible that the stakes around Cults Loch 3 did support a walkway.

There are at least three structures at Cults Loch 3 and there may have been more in the unexcavated areas around the edges of the crannog. However, there was probably only one main structure on the crannog at any one time, although there would have been enough space on the crannog for subsidiary structures. The most complete of the structures, ST2 had a footprint c 11 m in diameter which would have covered an area of 95 m². THE AREA OF THE CRANNOG ITSELF IS ESTIMATED TO BE ROUGHLY 895 M² so ST2 would have taken up only c 10% of the available space. This is in stark contrast to Milton Loch 1 where, at c 12 m, the diameter of the crannog itself is little larger than that of ST2

and Piggott's projected roundhouse would have occupied virtually all the available space. This model, of a single substantial island roundhouse occupying the whole footprint of the crannog, has also been posited for Dumbuck and Lochan Dughail, and given legitimacy by the numerous stone-built island duns in Argyll and the Western Isles (Cavers 2010 58; 2012, 176). Cults Loch 3, by contrast appears to be a settlement, in that it had a main structure with space around it for subsidiary structures and activity areas. The variations in function between crannogs that these differences imply are explored in [Chapter 9](#).

The footprint of ST2 is an arrangement of tangentially aligned timbers c 11 m in diameter, around a central hearth foundation; that much is clear, but what of the superstructure of the building? There is a scatter of stakes across its footprint but none of them form a pattern which could be related to the superstructure. The dendrochronological evidence indicates that many of the stakes probably relate to the pinning of the substructure (ie *QSP4x2* and *ALSP1x10*) but some have clearly been inserted through the floors of the building (see [Illus 27](#)). These stakes could, of course, postdate the building and relate to later activity associated with ST3, perhaps, but they could also relate to the construction or renovation of ST2.

One possible explanation for the lack of any coherent groundplan is that the walls of the building were never substantial and have subsequently not survived. Rather than a wall of posts the building may have had walls of wickerwork, withies woven around slender stakes. In Scotland the only clear evidence for the type of buildings erected on crannogs comes from Buiston where a wickerwork structure with double walls, 8 m in diameter, was uncovered (Crone 2000, 23). In Ireland the only comprehensive evidence for a crannog house is also a double-walled wickerwork roundhouse, 10 m in diameter, from Moynagh Lough (Bradley 1991). Despite excellent preservation of the floor surfaces at Drumclay crannog, Enniskillen there is no unequivocal evidence for the walls of the roundhouses; there are no circuits of substantial posts and the excavators are also postulating that the walls may have been wickerwork (Nora Bermingham pers comm). Admittedly, all these examples are Early Historic in date but one could argue that this lightweight type of construction was ideally suited to construction on an artificial foundation and was thus not a period-specific style. The contrast between the massive oak framework at Buiston, with all its complex carpentry, and the slight, vernacular style of the house is striking, and suggests that the choice of house building style was not because of

lack of timber or carpentry skills. A substantial postbuilt roundhouse of the type that characterises most Iron Age settlement may not have been a practical choice for a crannog. The earthfast posts of the Iron Age roundhouse, jammed in with packing stones, can resist the compressive and lateral forces placed on the structure by the weight of the roof, by wind and snow loading etc, but if the socket is dug into soft, unconsolidated sediment, even moderate force, particularly at the level of the eaves, would break the post out of its socket. Furthermore, any slumping of the substructure would be catastrophic for such a building whereas a wickerwork structure would be flexible and might remain substantially undamaged.

The use of lightweight wickerwork structures might explain why there is so little evidence for the nature of buildings on later prehistoric crannogs (Cavers 2010, 68). Despite good preservation conditions at Buiston, only a 4 m long arc of the wickerwork wall had survived, although numerous floors and hearths within the house were still extant (Crone 2000, 23). The alder stakes used in the wall were between 40 mm and 75 mm in diameter, while the hazel stakes which formed the inner lining were only 21 mm to 40 mm in diameter (*ibid* 90). Furthermore, they would have left little imprint; for example, the stakes of the double-walled wickerwork roundhouse at Deer Park Farms, Co. Antrim had been driven only 100 mm to 250 mm into the ground (Lynn & McDowell 2011, 135). Small stakes such as these are unlikely to have survived in recognisable form in the actively decaying conditions on Cults Loch 3.

Most wickerwork roundhouses in the archaeological record are, on average, between 6 m and 8 m in diameter (Lynn 1994, 90; Crone 2000, 108–109). Larger examples are known, such as the 10 m diameter house on Moynagh Lough crannog, so it would appear that size was not necessarily constrained by the building technique. However, this is a rare example and the size there may have been a reflection of the high status of the occupants (Lynn 1994, 91). We might thus reasonably envisage a smaller structure at Cults Loch 3 which did not fully span the 11 m diameter footprint of ST2. The footprint, defined by the tangentially-aligned timbers, could be seen as the house platform on which the wickerwork structure was positioned centrally, leaving a walkway c 1 m wide around it. Even more than the walls, the roof must remain entirely conjectural. Most wickerwork houses have no evidence for internal roof supports. At Deer Park Farms some of the collapsed wickerwork walls were so high (1.9 m and 3 m; Lynn & McDowell 2011, 599) as to suggest that there was probably no clear distinction between wall and roof, the walls

gradually curving inwards to form a domical roof. A reconstruction based on this interpretation has demonstrated that such a structure is viable and can support a roof of turves and thatch (Lynn & McDowell 2011, chap 33).

This model, of a house platform on which a smaller wickerwork house is constructed, could be considered for other later prehistoric crannogs. The evidence on which Piggott based her large roundhouse at Milton Loch 1 is flimsy (1953, fig 4) and also assumed a single phase of activity on the crannog, whereas we now know that there were probably at least two phases of activity separated by half a millennium (Crone & Barber 1993, 523). There are thus likely to be multiple structures amongst the evidence she uncovered. In her reconstruction Piggott postulated that there was an inner room, defined by the position of a threshold timber with two mortises (1953, 137 & fig 4). She further postulated (*ibid* 139) that the walls of this room were made of wickerwork screens, because large patches of wattle were found in the central area of the crannog. If this were a house rather than a room it would have been between 6 m and 7 m in diameter (if we follow the trajectory of the small holes on either side of the mortises in the threshold timber).

It is also important, however, to consider the possibility that relatively substantial structures could have been built on sites like Cults Loch 3 using techniques that do not leave 'earth-fast' traces. In several of the crannogs excavated to a sufficient extent, features were found that might indicate that the superstructural timbers were not founded in the crannog mound itself, but footed on socketed timbers or other stable platforms. For example, excavation at the Black Loch of Myrton has revealed oak posts with concave bases which rested on horizontal timbers (Crone & Cavers 2013); if these had been employed at Cults Loch 3 they would have left no physical imprint. If the Dumbuck crannog represents the remains of a building (an assumption that is far from above dispute, though the presence of artefacts typical of an Iron Age domestic context might provide support), it is hard to envisage more than one structure on the site, while the ladder found during excavation provides hints that the building may have contained an upper floor (Hale 2004, 150). Hale's suggestion that the stone-filled wicker stances found on some intertidal crannogs could have supported free-standing posts is certainly plausible and this seems a reasonable interpretation of the stone footings at Dumbuck, while the semi-socketed oak timbers found within the flooring logs may find parallels in the radial socket pads found at Lochan Dughail (see Cavers 2012; Munro 1893). Similar timbers were found at Cults

Loch 3 (eg T20 and T2, which was apparently staked in position), hinting that more substantial uprights may have been a feature of the Cults Loch 3 superstructures. The identification of cut peat and turves in the ecofactual assemblage, furthermore, raises the possibility of turf walling, so that the entire superstructure of a relatively substantial structure may have been composed of materials that simply would not survive on the surface of the site. Allison ([Chap 2c](#)) has suggested that one possible reason for the small numbers of insect taxa associated with dead wood is that much of the superstructure may have been built of materials other than wood, such as turves and cut vegetation. The walls and roof of a building constructed in this way would be virtually invisible within the decay horizon.

The other issue to consider when attempting a reconstruction of the buildings on the crannog is postabandonment activity. If the buildings were in use sequentially then it would make sense to dismantle them to provide both space and building materials, and in the final abandonment it seems highly probable that all valuable re-usable timbers were removed from the crannog. This might explain the small number of oak timbers left on the crannog. Posts like those from the Black Loch of Myrton could be removed without trace, while the extraction of 'earthfast' posts from the organic matrix of the crannog mound would have left a virtually untraceable imprint, the soft sediments closing over the posthole.

The nature of the other two structures on the crannog is more difficult to entangle. ST1 is most akin to ST2, with its central hearth foundation and platform of tangentially aligned timbers. It was truncated to the E by ST2 and its western half could not be fully investigated because of water levels but it must have been at least 9 m in diameter, based on the spread of the plant litter flooring around the hearth foundation. Again there is no unequivocal evidence for the superstructure.

ST3 is the most amorphous structure of all, with no clear central focus. Nonetheless, the ecofact analyses, particularly those of the insect remains, indicate that the area defined as ST3 was a covered building, in which plant litter floors were regularly laid down, decomposed and hosted house faunas. It is now thought that the stone-built features included within the footprint of ST3, (204) and (214) probably belong to the later 2nd century BC re-use of the crannog.

Both ST1 and ST2 were built around a core mound of gravel on top of which the hearth foundations were built. These structures are described as such because there is no evidence that any burning took

place within them. They appear to have been designed to create a raised fireproof foundation, on top of which an open fire could have been built. Both H1 and H2 consist of roughly square frameworks of logs filled with fireproof deposits (Illus 33). H1 is the simpler of the two structures, with just two fills of clean gravel creating a surface level with the top of the log framework. In the absence of any stone structure we must assume that an open fire was lit on this surface which was regularly cleaned off; a small deposit of hearth debris abutting the framework hints at this. H2 is larger (1.8 m square compared to 1.30 m square for H1) and more complex; it is possible that H2 has been renovated several times. The sides of the framework are two logs high and within this a primary deposit of coarse sand had been laid down. A natural peat had then been packed around the sides of the framework forming a bowl-shaped depression within which gravel containing occupation debris had been laid. Again, this sequence of deposits suggests efforts to create a raised fireproof foundation. Stacked slab-like stones suggest that H2 may have been defined with a small wall, possibly to keep the surrounding organic flooring from catching fire. A similar arrangement can be seen at Milton Loch 1; here the excavator interpreted a spread of flat stones roughly 3.7 m square which had been daubed with clay as a hearth (Piggott 1953, 137) but this would have been an excessively large hearth and it seems more likely that this was a fireproof surface on which an open fire could be lit and contained.

The floor surfaces and living conditions on the crannog

The sub-floors of the structures consisted of large logs over which bundles of brushwood and small logs were laid. Significant wooden objects were laid down with these sub-floor deposits in ST1 and ST2, and the cache of quartzite pebbles in ST3 may represent the same type of deposition. Layers of plant litter, primarily bracken, rushes, sedges and grasses but also including leaves and some mosses were then laid down. These plant litter layers were initially interpreted as the active floor surfaces but they are surprisingly clean, containing only trace amounts of hearth and cooking debris. One possible explanation is that when the floor was refreshed the surface onto which debris would have been trampled and spilt was scraped off and either burnt or dumped. However, the micromorphological evidence shows that inorganic materials, sands and gravels were then scattered over the cleaned surfaces. This sequence, of alternating plant litter and inorganic layers was not often visible during excavation because they had been so compressed, but it could be seen in thin-section in

deposits such as (636), (208), (609) and (643).

It is striking that the hearth debris, cooking and food processing waste is concentrated primarily in the inorganic deposits on the crannog, in deposits such as (520), (511), (602), (606), (620), (615) and (215). It is difficult to envisage a mechanism whereby household waste was introduced into these deposits other than via trample and spillage on floor surfaces. It thus seems more probable that the inorganic layers formed the active floor surfaces and survive only as thin lenses because they too were also scraped off. There is evidence for both the burning and dumping of discarded floor layers on the crannog, particularly in the N quadrant, where they may have been mixed in with fresh dumps of inorganic material brought from the loch shore to form a 'quarry' of material which could be used for resurfacing work on the crannog. This is perhaps what deposits (501), (502), (503) and (504) represent. The use of inorganic flooring may have been for the purposes of damp-proofing the living space, and this evidence accords well with the interpretation of a thick deposit of blue/grey clay encountered at Dorman's Island, Whitefield Loch. At that site, the clay deposit had initially been interpreted as a hearth base, but thin section analysis showed that, as at Cults Loch 3, it comprised numerous surfaces interspersed with organic materials and traces of occupation debris like burnt bone and ash (Cavers *et al* 2011, 91–92). Other crannogs investigated by antiquarians in Wigtownshire apparently showed evidence for similar strategies for flooring and damp proofing with inorganic materials, including Barhapple (Wilson 1882, 54), the Dowalton crannogs (Stuart 1866) and Black Loch of Myrton (Maxwell 1899).

Thicker deposits of inorganic materials containing household waste were used to raise and level the floor surfaces. In ST2 there are two such leveling episodes represented by gravel deposits (621) and (602) and is perhaps significant that these occur over those surfaces which display evidence for periods of abandonment of the structure, ie (622) and (609). If ST2 was flooded after surface (622) was laid down it would make sense to substantially raise the surface of the floor when returning to the building. In ST1 gravel deposit (511) represents the final leveling episode in ST1; indeed, it is so extensive that it might represent leveling of this part of the crannog after the abandonment of ST1.

The insect assemblage indicates that, on the whole, living conditions on the crannog were fairly dry and comfortable most of the time (Allison *infra*). Foul conditions did develop but this may have been below the floor surfaces in response to rising damp. However,

the presence of house fly populations in ST1 and ST3 suggests that occasionally the surfaces of the floors became very unpleasant, while other decomposer beetles suggest the presence of manure-like deposits.

There are hints that parts of the crannog may have occasionally flooded. This could have been caused by raised water levels but the substructure of the crannog may also have slumped, creating a hollow into which water pooled. In ST1 one area of the floor was refurbished several times, firstly with re-used planks and subsequently with small logs. Even when found these surfaces dipped down, as though sliding off the side of the gravel mound which forms the foundation of ST1, and suggesting that the substructure at this point had remained unstable.

Domestic and agricultural activities

The occupants of the crannog were involved in a range of domestic and agricultural activities. The chaff found in a number of deposits in ST1 and ST2 indicates that cereal processing was being undertaken on the crannog, the five saddle querns and six rubbing stones providing the tools with which to do the work. The occupants were presumably undertaking the cultivation themselves, the ardshare under ST1 signifying their intimate relationship with the land. Emmer and barley were their main crops and it is possible that they cultivated a little bread wheat and spelt, although it is more likely that these represent traded items. Meat was clearly an element of the diet on the crannog, given the scatter of burnt bone in many deposits, but the only identifiable fragment of bone was a sheep phalange. Sheep, as well as goat are both attested by the presence of biting lice specific to each animal. However, there was no evidence for animal faecal waste so it is unlikely that the animals themselves were stabled on the crannog; it is more probable that the lice arrived on the crannog on untreated goatskins and sheep fleeces. This contrasts with the indications from Dorman's Island, Loch Arthur and Oakbank, all of which pointed to the presence of livestock on the crannog itself (Bogaard 2004; Henderson & Cavers 2011, 115; Dixon 2004). It is possible that the close proximity of the crannog to the shore at Cults Loch 3 allowed animals to be corralled nearby on dry land. Indeed, dung beetles were abundant in all the contexts examined for insect fauna suggesting that grazing animals were a common presence around the loch (Allison *infra*). The 'June bug', *Phyllopertha horticola*, which is characteristic of poor quality permanent grassland on light soils, was also abundant in the insect assemblage, again suggesting that pasture might have been

the dominant form of landuse around the loch.

The ability to leave livestock on the shore, while living on the crannog itself has important implications for the 'mentality' of the settlement in terms of security and defence (see discussion by Cavers 2010, 71), and therefore for the motivations of building on water in the first place. This issue will be discussed further in [Chapter 9](#).

Some cooking and cleaning may have taken place offsite. The use of what looks like a trough lining from a burnt mound in the foundation of the crannog, together with spreads of fire-cracked stone on the crannog suggest that the occupants were familiar with burnt mound technology and that there was probably one nearby. Burnt mound debris has been found on other settlement sites (Barber 1990) and was also used as foundation material at Buiston crannog (Crone 2000, 103–104).

Various craft activities took place on the crannog. The occupants were making flint tools from locally sourced flint nodules, an expedient industry much like the use on site of water-worn cobbles for a range of pounding and grinding functions. Some of these flint and coarse stone tools may have been used in the processing of hides, and some activity involving the use of dye or pigment which has left stains on two of the coarse stone tools was also undertaken on the crannog. Evidence for flint working is recurrent on excavated sites in southern Scotland, though the assemblages are generally small (McCullagh & Haselgrove 2000, 185) and the assemblages lack the consistency of form that earlier prehistoric toolkits feature. Flint working appears to have been common on Iron Age settlements in Galloway, but these late lithic traditions are still poorly understood. At present, the conventional view is that they were expedient tools used as a supplement to metal blades. However, this view seems at odds with the abundant evidence for the use of metal tools attested by the toolmarks present on timbers across the site, perhaps suggesting that flint scrapers and blades were reserved for a specific function.

Woodworking evidence from the crannog points to the use of a range of metal tools, including relatively broadbladed axes or adzes as well as finer blades, probably including knives and chisel-like tools. Iron toolkits are not well represented in the Scottish Iron Age; very little is known about the range and form of axes and other heavy woodworking tools and even less about lighter blades and chisels. The adoption of iron in Scotland was apparently very limited in the mid-1st millennium BC, while the poor survival of iron in most Scottish soils means that the recovered corpus of axe finds is likely to be poorly representative of how commonly they were used. Sands

(1997) has discussed axe types used on the mid-1st millennium BC crannog at Oakbank, with his analysis of blade widths showing that axes of the latest bronze or earliest iron socketed types were used (ibid 81). One axe however, his core group N, was in the upper range for late Bronze Age axe blade widths, and may have more likely been an iron blade. Sands points out that of the 696 British socketed bronze axe finds, only 61 have blade widths over 60 mm while iron blades are often wider (ibid 81), so that the tool facets on timbers like T33 from Cults Loch 3, with a possible blade width around 65 mm, might lend weight to the probability that an iron axe was used. Only a handful of socketed iron axes have been found in Scotland, including one from Traprain Law in association with late Bronze Age activity, probably no later than around the 8th or 7th century BC (Burley 1958, 210, no 473), and another from the Lochend crannog at Coatbridge (Monteith & Robb 1937), now lost. Bronze socketed axes are well represented in Wigtownshire, with nearby examples from Innermessan (Wilson 1880, 135) and Genoch Mains (Schmidt & Burgess 1981, 127) among a group of around 20 examples from Galloway and South Ayrshire.

The occupants of the crannog site were also making stone bangles using imported materials, engaging in what appears to have been an extensive regional trade in cannel coal or shale using either sources in Ayrshire or Antrim (Hunter & McLaren this volume, [Chapter 7](#); Hunter 2007). As well as the shale, the glass bead and possibly the spelt and bread wheat, also indicate involvement in trading activities.

Evidence for the use of ceramics was entirely absent, and bearing in mind the possibility of poor survival of under-fired coarse pottery in waterlogged deposits, it seems probable that Wigtownshire had entered the 'genuinely aceramic' phase of later prehistory by the 5th century BC. The wooden box, SF38 is probably more representative of the containers that were in use.

The lack of quern stones on settlement sites has been interpreted as an indication of relatively fleeting or seasonal occupation of Iron Age settlements (eg McLaren & Hunter 2007, 222); by this logic, the presence of five quernstones on the crannog would imply that occupation was on a more permanent basis, although there are notable absences, like spindle whorls and bone implements (although these would only have survived on the crannog if burnt), that would have been typical of the full Iron Age domestic assemblage. The impression given by the material evidence for activity at the crannog, then, is conflicting- on the one hand the incomplete artefact assemblage and lack of evidence for livestock implies that the site was

used on a temporary or seasonal basis, while on the other the presence of quernstones accords more comfortably with a permanently occupied settlement.

It is possible that many of the activities described above were undertaken only in ST1 and ST2. ST3 displays a number of attributes which appear to distinguish it from the other structures. Firstly, there is the distribution of artefacts across the crannog ([Illus 90](#)); while there are distinct clusters of stone and lithic tools in ST1 and ST2 the absence of artefacts over the area of ST3 is notable. The structural evidence appears to differ significantly in that ST3 lacked a central timber hearth foundation and tangential timber sub-floor and had a larger inorganic component in its build-up. It is also possible that the nature of the foundation deposits under the house floors differ (a cache of quartz pebbles under ST3 in contrast to the wooden objects under ST1 and ST2), although it must be acknowledged that the lowermost deposits in ST3 were only glimpsed in small trenches. The build-up of organic floor deposits and the development of housefly populations indicate that, like the other buildings ST3 was occupied but food remains, in particular cereals and hazelnut shell were found only in small amounts in comparison to the concentrations in ST1 and ST2. These differences may have arisen because of differential preservation in this area and because the high water table under which it was excavated prevented more extensive investigation of the lower deposits but nonetheless, it remains a possibility that it had a different function, one that was not associated with food production and craft and agricultural activities.

3 Cults Loch 4; the promontory fort

Introduction

The promontory fort at Site 4 was investigated over two seasons, in 2009 and 2010. Visible only in aerial photographs, the fort was nonetheless clearly a major fortification, located on a spur of land that juts into Cults Loch from the S shore and less than 30 m across the water from Cults Loch 3. Radiocarbon dated core samples of peat from the marsh to the W of the promontory show that the area would have been marshy, boggy ground, much as today, with open water only on the E side of the promontory ([Chap 8](#)).

The central, enclosed area of the fort comprises a roughly oblong mound, around 80 m N-S by 62 m E-W, which is overlooked by a series of natural terraces to the S. Presumably, this compromise in the defensibility of the natural topography was what necessitated the construction of two defensive outworks upslope from the enclosure, providing the primary defences of the site. The natural approach to the site is from the SW, through a low-lying hollow close to the edge of the marsh.



Illus 103. Aerial photograph of Cults Loch 4, taken in 1978 (RCAHMS)

Aerial photography

The fort was identified on aerial photographs taken in the late 1970s, and several features were identified on a series of images collected in 1984 and 1992 ([Illus 103](#)). Most striking is the presence of the outermost, upslope ditches (referred to as Ditches 1 and 2 below), which appear as light linear cropmarks encircling the promontory. The larger, internal ditches are not easily discernible, though the low-lying ground in this area presumably retains more water than the upslope areas, making the identification of ditches difficult. No obvious features are visible on the photograph within the enclosed area of the fort, although the encircling scarp identified in the geophysical data and encountered in Trench 5 (below) is apparent.

Geophysical survey

Tessa Poller

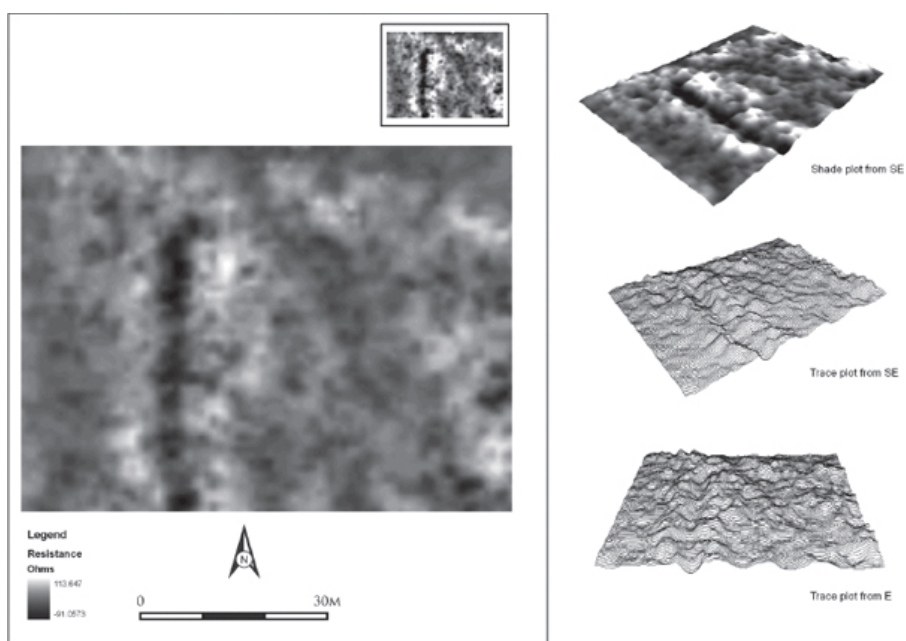
In order to verify the locations and extent of the archaeological features depicted on the aerial photographs, geophysical survey was undertaken using both resistivity and fluxgate gradiometry. Resistivity survey was carried out in advance of excavation; the gradiometry survey was carried out retrospectively with the aid of an additional research grant from the Society of Antiquaries of Scotland.

Resistivity

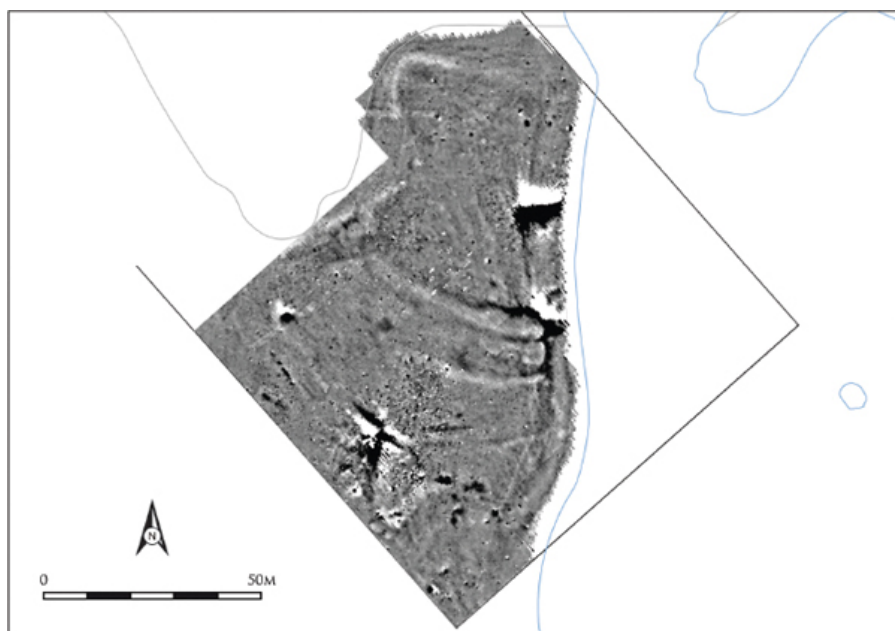
The results of the surveys were variable. The large enclosure ditch depicted on the aerial photographs was clearly detected ([Illus 104](#)), surrounded by areas of high resistance. Interestingly, the inner ditches were not identified in the resistivity survey, though these show clearly in the magnetometry survey.

Gradiometry

The outer ditch, so clearly visible as cropmarks and in the earth resistance survey results, is virtually undetectable in the gradiometry survey ([Illus 105](#)). Nonetheless, subtle traces of this ditch may just be identified as segments characterised by two narrow, less than 2 m wide, curvilinear anomalies ([Illus 106](#)). At the west end of the ditch, coincident with one of the evaluation trenches, there is a dipole which may relate to a metallic object. Near the centre of this ditch is a large area of modern debris and soil disturbance. On the ground at this point there are dumps and linear banks of stone, brick and concrete, which may include buried metallic objects. This material has a strong magnetic response defined by a strong dipole and an associated spread of variable magnetism. To the southeast of this area are several small positive anomalies which appear to correspond to modern scoops.



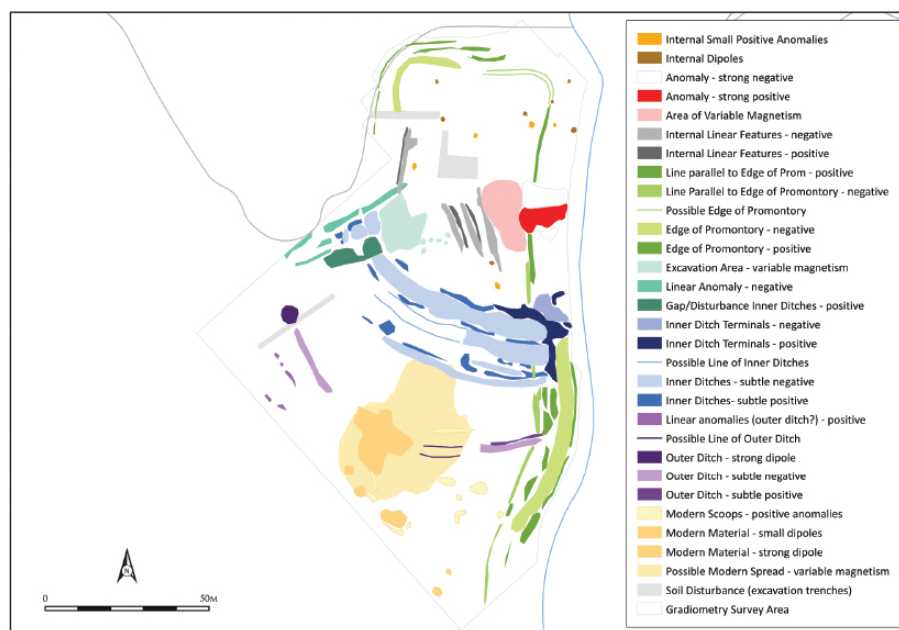
Illus 104. Results of the resistivity survey undertaken over the terminal of Ditch 2



Illus 105. Results of the gradiometry survey carried out on the promontory in 2011

To the west, there are traces of short curvilinear positive anomalies, which appear to be on the same alignment as the outer ditch. Stretching across the middle of the promontory three concentric curvilinear features are interpreted as ditches. The inner two are up to 6 m wide, while the third is about 2 m in width. All three ditches are

characterised by a subtle negative response haloed by a band of positive magnetism, which is particularly strong around at the eastern end. The magnetic response of these features becomes more diffuse towards the west. Here there are several linear features perpendicular to the ditches corresponding to the entrance through the defences.



Illus 106. Interpretation of the gradiometry results

The survey also detected magnetic changes along the edges of the promontory. On the east side of the promontory, towards the south, the slope has a subtle negative magnetic signature, which is bounded by a narrow positive band at its base. On the top of the slope there is another positive band. These positive bands may reflect layers of gravel that are exposed near to the surface of the slope. Further upslope there is another linear narrow band of negative magnetism, which may be a result of modification of the edge of the slope. This band is detected on either side of the ditches, yet the relationship between these features cannot be determined. On the northwest edge of the promontory several narrow bands of positive magnetism relating to gravel lenses were also recorded.

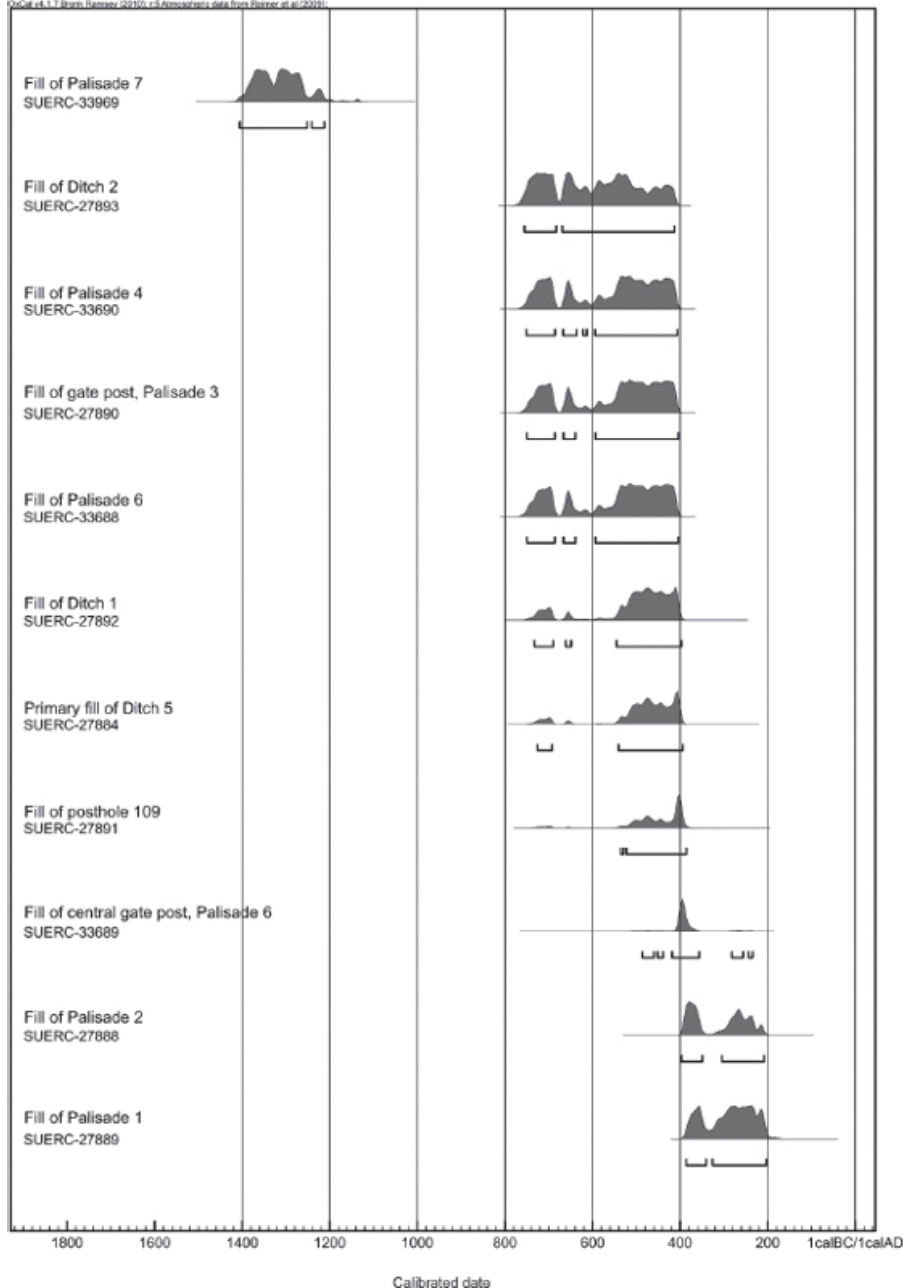
Within the enclosed area only a few anomalies were recorded. About 20 m north of the innermost ditch terminal, on the east edge of the promontory, there is a very strong positive and negative anomaly. The intensity of this feature represents a very magnetic object, perhaps a large modern metallic drainage feature, or underlying

igneous geological anomaly. An area of variable magnetism to the west of this anomaly may be a result of soil disturbance. Although partially obscured by the inner ditches, a similarly large and strong positive and negative anomaly was recorded near the eastern ditch terminals and may be related.

Three possible short parallel linear features (subtle negative and positive magnetism) aligned in a roughly north to south direction lie near the centre of the interior. These could be the remains of relict ploughing of the promontory or other cut features. An area of variable magnetism located just within the inner ditches corresponds to the excavation trenches dug in 2010.

Excavation results

The results of the excavation are presented here in chronological order. Evidence for activity in the Neolithic, Late Bronze and Iron Ages was recovered, although the majority of evidence relates to the latter. The radiocarbon dates from the site are presented in [Table 12](#) and [illus 107](#).



Illus 107. Cults Loch 4; the radiocarbon dates (graph produced using OxCal v4 1.7 Bronk Ramsey 2010; r:5 Atmospheric data from Reimer et al 2009)

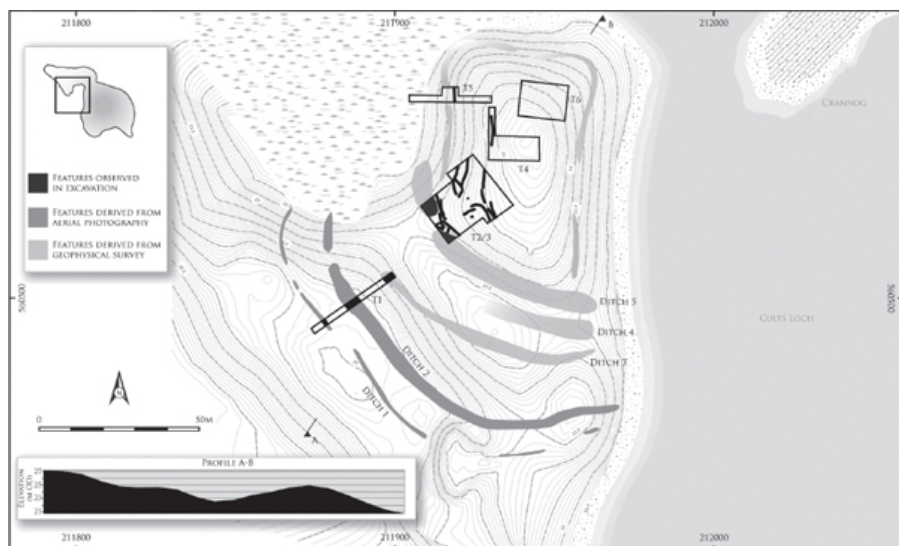
A total of six trenches were excavated ([Illus 108](#)). Initially, and in the absence of the gradiometry survey results, Trenches 1 and 2 were chosen to verify the presence of the features visible on the aerial photographs. Following the positive results obtained from the first two trenches, Trench 2 was extended to investigate more of the internal

features, while further open areas were investigated within the interior in Trenches 4 and 6. Trench 5 was positioned in order to investigate the large ditch encountered in Trench 3, which was anticipated to continue around the promontory, as suggested by a very slight scarp visible at several points on the enclosed mound.

No artefacts were recovered from any of the features excavated in Trench 1. A single worked flint (SF4/1), possibly the end of a plano-convex knife, was recovered during the initial clean of the trench, and is thought to have come from the overlying topsoil.

Neolithic activity

Nothing clearly indicating the presence of Neolithic activity was detected on site during the excavations. However, radiocarbon dating of one of the internal pits, pit (347), produced charcoal dating in the range 4540–4360 cal BC (SUERC-33691). Pit (347) was cut into the centre of a large sub-circular pit (348), which lay just inside Palisade 6 (Illus 114). Pit (348), was c 2.0 m in diameter and was barely visible in the surrounding natural, indicated only by the presence of a brown–orange, possibly heat-affected fill. The main fill of the pit overlay a primary fill, a very dark brown–black greasy silty sand. The deposit was suggestive of burning *in situ*, but no charcoal fragments were noted. There are few indications as to the purpose of pit (348) but it must be Neolithic or earlier.



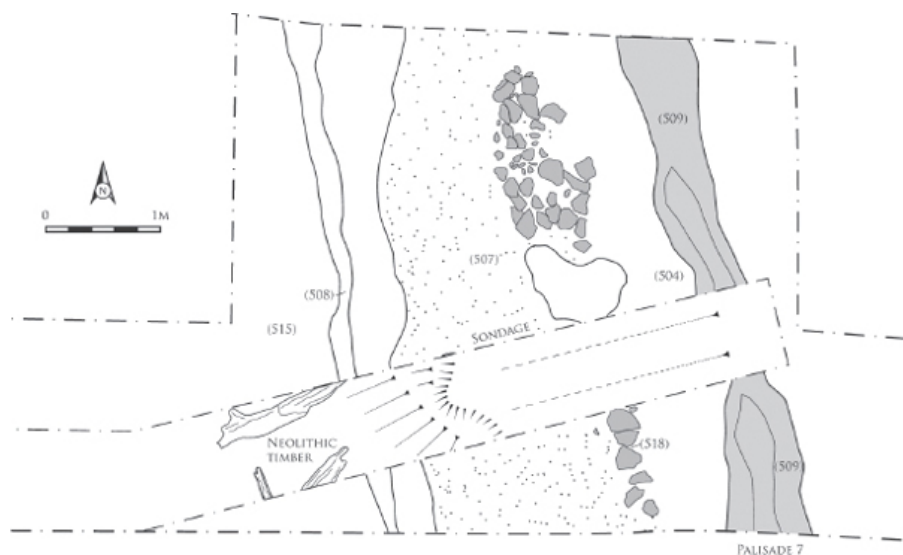
Illus 108. Topographic survey of the promontory showing the principal features identified on aerial photographs, through geophysical survey and in excavation

Table 12. *Cults Loch 4; radiocarbon dates*

Lab ID	Sample ID	Context	Material type	Species	$\delta^{13}\text{C}$ (‰)	Radiocarbon age (BP)	Calibrated radiocarbon date cal BC (95% confidence)
<i>Neolithic activity</i>							
SUERC-33691	[348]	Fill of pit [347]	charcoal	<i>Corylus avellana</i>	-28.9	5635±30	4540–4360
SUERC-33692	T5.1	Timbers at bog edge	waterlogged wood	<i>Quercus</i> sp.	-26.3	5430±30	4350–4230
<i>Bronze Age enclosure</i>							
SUERC-33696	[509]	Fill of Palisade 7	charcoal	Pomoideae sp.	-25.5	3040±30	1410–1210
<i>ELA enclosure</i>							
SUERC-27893	[209]	Fill of Ditch 2	charcoal	<i>Corylus avellana</i>	-24.9	2460±30	770–400
SUERC-33690	[366]	Fill of Palisade 4	charcoal	Pomoideae sp.	-26.3	2440±30	760–400
SUERC-27890	[135]	Fill of posthole [104] in Palisade 3	charcoal	<i>Corylus avellana</i>	-26.4	2435±30	760–400
SUERC-33688	[326]	Fill of Palisade 6	charcoal	<i>Alnus glutinosa</i>	-27.1	2435±30	760–400
SUERC-27892	[206]	Fill of Ditch 1	charcoal	<i>Corylus avellana</i>	-25.8	2405±30	740–390
SUERC-27884	[142]	Primary fill of Ditch 5	charcoal	<i>Corylus avellana</i>	-24.3	2390±30	730–390
SUERC-27891	[148]	Fill of posthole [109]	charcoal	<i>Betula</i> sp.	-26.9	2365±30	520–390
SUERC-33689	[318]	Fill of posthole [317] in Palisade 6	charcoal	<i>Alnus glutinosa</i>	-26.7	2325±30	410–370
SUERC-27888	[137]	Palisade 2	charcoal	<i>Corylus avellana</i>	-26	2265±30	400–200
SUERC-27889	[151]	Palisade 1	charcoal	<i>Quercus</i> sp.	-26	2230±30	390–200



Illus 109. View of Trench 5, showing Palisade 7 and the remains of the primary rampart



Illus 110. Plan of Trench 5

Nothing else suggested the presence of a substantial Neolithic site on the promontory, but one of the oak logs found beneath the debris of the rampart collapse in Trench 5 (see below) was subsequently dated in the range 4350–4240 cal BC (SUERC-33692), suggesting that there may be much more evidence for this earlier prehistoric phase to be found. The potential of the Neolithic wetland remains that survive in the bog to the west of the promontory, unfortunately outwith the remit of the current project, is considerable.

Bronze Age activity and the early phase of enclosure

A feature which at first appeared to be a ditch, was exposed in Trench 5, visible as a dark strip of gravelly sand, c 1.5 m in width running N–S ([Illus 109–113](#)). This feature was accompanied on the E side by a line of sub-angular and sub-rounded stones (518), ranging in size from 0.11 m to 0.36 m across. In places these were several stones thick, suggesting that they had been placed there and were close to their original positions. This line of stones may have constituted a footing or low revetment of a bank, c 1.5 m wide, the remains of which were indicated by a thin deposit of pale cream sandy silt (519). This revetment directly overlay a thin dark brown sandy silt (516) and a thin grey sandy silt deposit (510), interpreted as a possible turf and thin soil horizon onto which the revetment was directly placed. Immediately to the E of the bank, Palisade 7 ran N–S across the trench; the fill was a dark brown–black silt (509). It is likely that Palisade 7 formed the inner revetment for the bank.

It became clear upon excavation that the bank was not accompanied by a ditch of standard V- or U-shaped profile. What had initially appeared to be natural subsoil into which the ditch feature was cut (see [Illus 111](#) and [112](#)) was in fact an overlying deposit of orange gravel (515). This deposit was very similar to the surrounding natural, and was virtually archaeologically sterile. (515) overlay a black silty sand (508) containing very small flecks of charcoal, which in turn overlay an orange gravel deposit (505), very similar to (515). All of these deposits overlay the grey-brown sandy gravel (507). This deposit butted up against a deposit of sub-angular stones (514) averaging c 0.1 m across in a matrix of brown/grey silty sand at the base of the slope. The source of these deposits is not entirely clear, but it is possible that they derive from the primary collapse of the bank.

Directly beneath deposit (507) was a series of intermixed bands of natural sands and darker sandy silts (523), which lay directly on a steeply sloping face of natural sand and gravel (520). These bands were interpreted as alternately washed out and buried layers of natural subsoil, deriving from the steeply cut face of the slope. These washed deposits merged into much wetter, peat-like layers near the base of the slope. The highest of these, (512) was an orange-brown peat rich in mineral material, and contained frequent small stones and frequent roundwood twig fragments. Regular charcoal fragments were also noted in this deposit. Beyond the extents of (512), more archaeologically-sterile peats containing frequent modern tree roots were recorded.

Trench 5: summary of interpretation

The most plausible explanation for the deposits encountered in Trench 5 is that the hill was cut to form a steep slope, over 1 m high and sloping down to boggy ground or possibly even shallow open water ([Illus 111a](#)). A stone footed bank with a retaining palisade was then constructed using the upcast from this cutting. Erosion of the newly cut natural face resulted in the intermixing of natural and archaeological deposits (523). Following the dilapidation of the rampart, much of the upper bank material slumped down slope, while ploughing in the centuries following the abandonment of the site may have completely destroyed the remnants of the bank and moved the source natural material down slope to form deposit (515). The interpreted sequence of rampart construction and collapse is shown in [Illus 111b](#). It is notable that the redeposition of natural gravel downslope from the rampart, which caused the initial misidentification of the scarped slope as a cut ditch, also led to the

misleading appearance of a ditch in the geophysical results ([Illus 106](#)).

A single date in the mid-later Bronze Age (1410–1210 cal BC, SUERC-33696) was returned from charcoal retrieved from the fill of Palisade 7, in Trench 5. This date implies some activity at the site in the Late Bronze Age, but the fact that this date is isolated in the sequence might warn against the assumption that it is to this horizon that the palisade slot belongs. Residual charcoal from a period of activity in the later Bronze Age could easily have been incorporated into the fill of the palisade if dug in the earlier Iron Age along with the larger ditches (see discussion, below). The character of this innermost fortification is different to those larger defences, however, so that the interpretation of these features as earliest in the sequence may nonetheless be correct ([illus 113](#)).

The earlier Iron Age enclosures

In the mid-1st millennium BC the defences of the promontory were greatly enhanced, probably involving the addition of five further ditches, cutting the promontory off from the land to the south, and including the addition of two ditches upslope from the promontory which restricted access to the site to a single entrance in the SW.

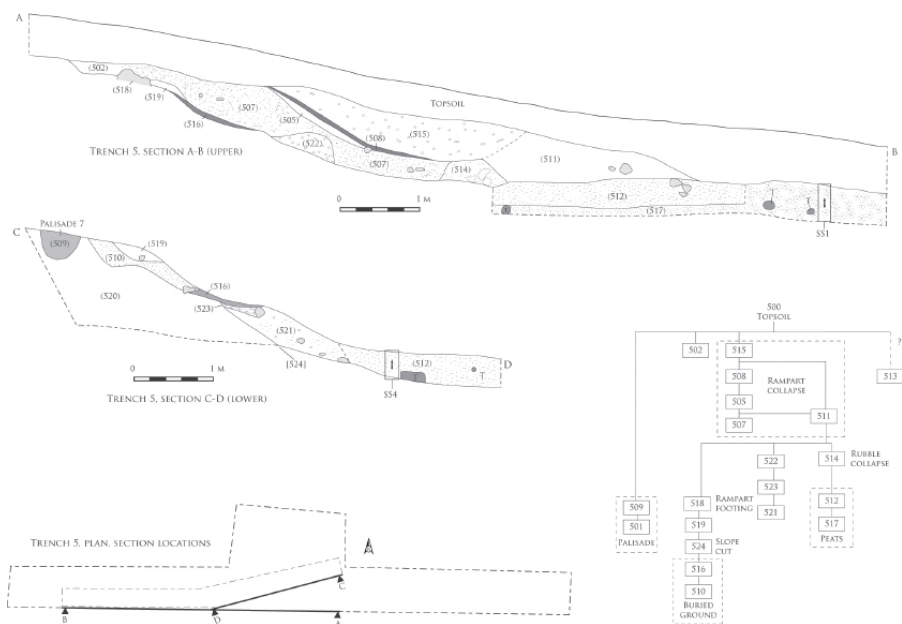
Ditch 1, probably the slightest of these, was just clipped in the SW extremity of Trench 1 ([Illus 114](#)) and comprised a steep-sided cut with a U-shaped profile. The ditch had four fills ([Illus 115 & 116](#)), two of which contained patches of natural orange sand and gravel, probably redeposited and perhaps deriving from an associated upcast bank. This interpretation was supported by the uppermost fill, a compact red-orange sand with regular small stone and charcoal inclusions, closely resembling the surrounding natural; it seems probable that this material had derived from the erosion of an associated bank to the N of the ditch. Approximately 2 m to the N of the ditch was a single large posthole (202), but no other features were associated with the ditch.

Ditch 1 was not on the same scale as Ditch 2. Ditch 2 was located in the centre of Trench 1, running E–W across the flat plateau overlooking the promontory. It measured 5.5 m across and was 2.2 m deep with a broad U-shaped profile and a concave base ([Illus 114–116](#)). There were three fills, the upper being a compact orange-brown stony deposit, while the middle of the fills was a very stony deposit, comprising a mid-dark brown silty sand with regular charcoal lumps and very discrete ‘bands’ of stones running across the trench. It is likely that the stony deposit was derived from an associated bank, probably, though not certainly located on the N side of the ditch.

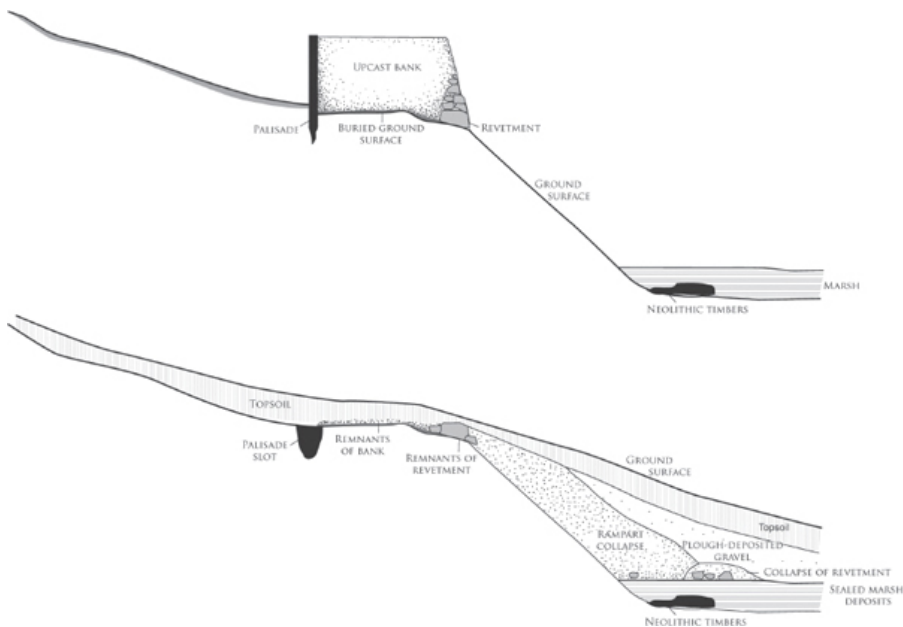
The final feature recorded in the trench was a possible further ditch, Ditch 3, running E–W across the trench at the extreme N end of the excavated area. Only 0.4 m depth of the deposit could be excavated in the exposed area, but the fill was a dark orange–brown compact silty sand similar in character to the upper fill of Ditch 2, and contained charcoal flecks.



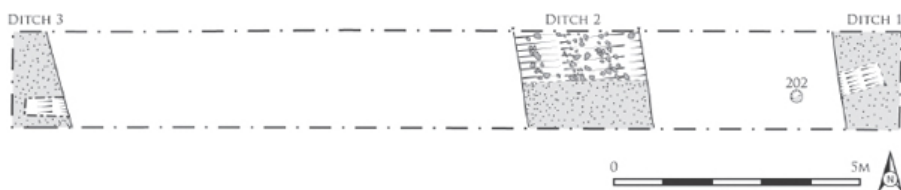
Illus 111. Section through deposits in Trench 5



Illus 112. Annotated photograph showing the sequence of deposits excavated in Trench 5



Illus 113. Schematic representation of the interpretation of the Bronze Age fortification of the promontory (A), and a simplified representation of the corresponding features excavated in Trench 5 (B)



Illus 114. Plan of outermost ditches, Ditches 1 to 3, in Trench 1

On the promontory itself, a series of palisade fences and the innermost ditch, Ditch 5, were uncovered in Trenches 2 and 3 ([Illus 116–118](#)). The trench was clearly located over the entrance to the site, and it was apparent that several phases of construction and rebuilding of the enclosure fences had taken place. It was not possible to demonstrate continuity with the early-phase enclosure works encountered in Trench 5. It is possible that Palisade 5 equates with the inner palisade of the first-phase enclosure found in Trench 5: this would imply that the entrance in this phase was located in the same position, although the eastern terminal of the first-phase enclosure cannot be confidently identified.

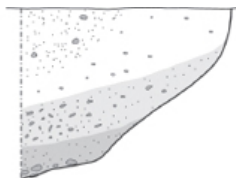
It seems that at least three lines of palisades were built on the promontory. In general, all of the palisade slots were similar, being around 0.2–0.3 m deep with steep sided U-shaped profiles. Two of these, Palisades 2 and 6, were very similar in design, with the gated passageway through each protected by a short length of ‘baffle’ walling. Palisade 6, the innermost palisade identified on the site ran close to the upper break of slope of the promontory mound, and had an entrance 5 m in width, within which was a single large posthole (317) with a stony, charcoal rich fill. A radiocarbon date from this fill was returned at 490–230 cal BC 410–370 cal BC (SUERC-33689). The baffle wall in front of this gate obstructed direct access through the palisade: the precise arrangement of these structures is not easy to reconstruct, although presumably posthole (317) accommodated the central gatepost for the gate through Palisade 6, with the baffle wall restricting access into the interior to the sides of the gate. The eastern side of Palisade 6 may have been refurbished, with slot (305) replaced by slot (306), possibly involving a realignment of the entrance gate.

Palisade 2 seems to have been of a very similar design, although the latter lacks the central gate post of Palisade 6. Palisade 2 was also protected by a baffle wall across the entrance, which must have restricted access through this outer enclosure to a gap only around 0.5m across at the east side of the entrance. The original slot of Palisade 2, (129), was recut with a new slot close to the entrance, (128); the fill of Palisade 2 produced a radiocarbon date calibrating in the range 400–200 cal BC (SUERC-27888).

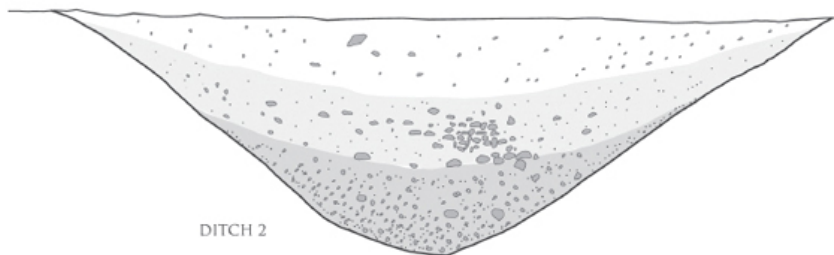


Illus 115. Section through Ditch 2

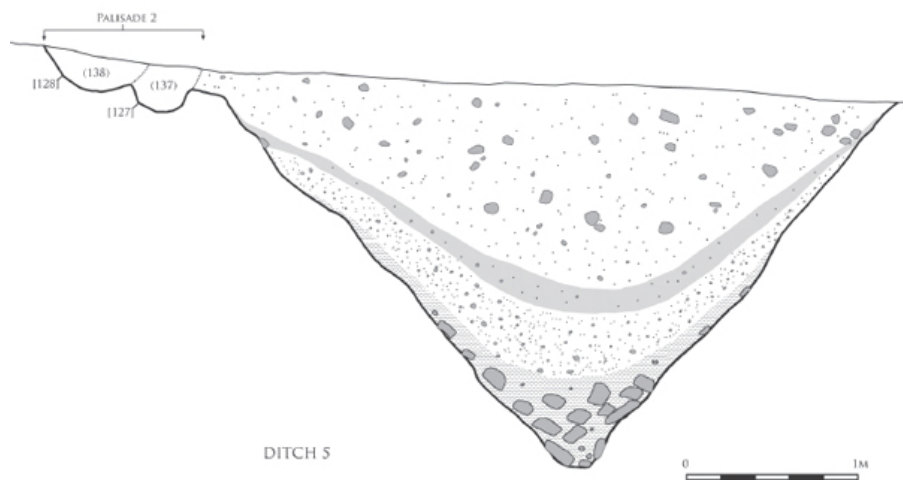
DITCH 1



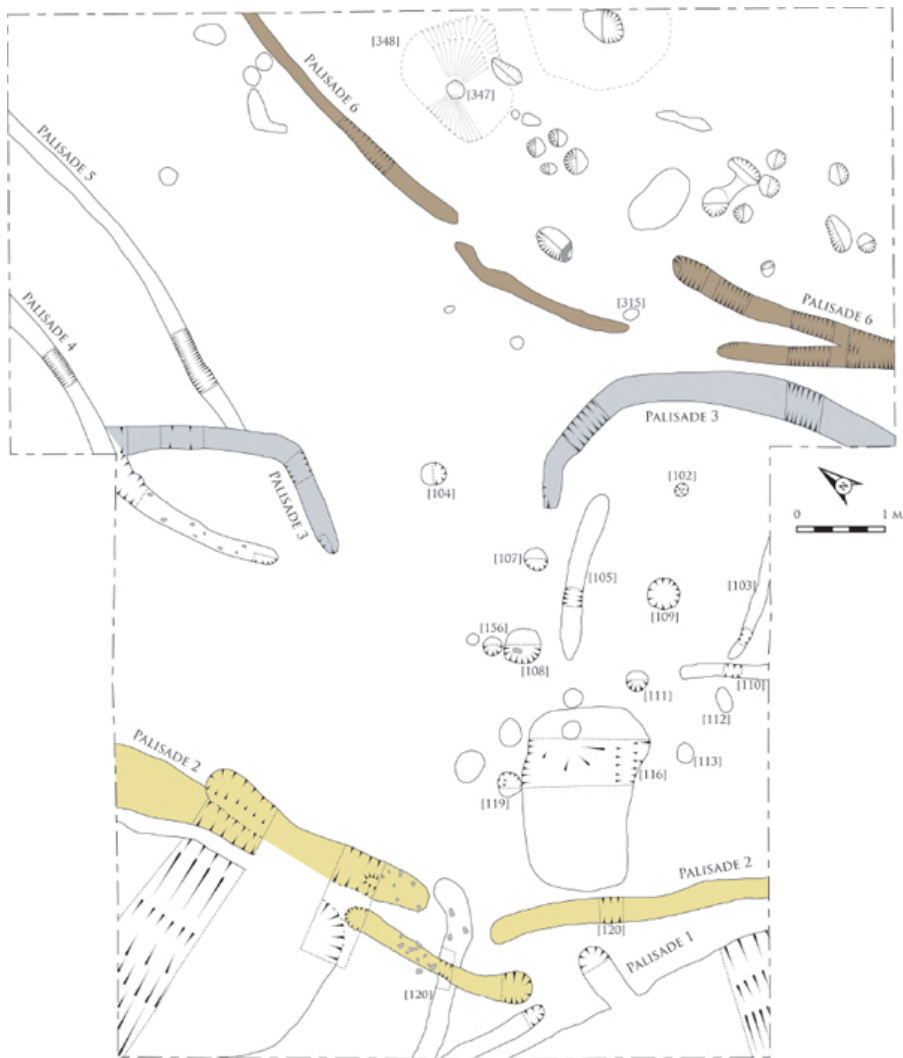
DITCH 2



DITCH 5



Illus 116. Sections through Ditches 1, 2 and 5



Illus 117. Plan of Trenches 2 and 3

This arrangement of palisades or fences must have meant that access through the entrance investigated in Trench 2/3 was very constricted, and would only have been possible on foot. This would certainly have been the case when Ditch 5 was cut, since the space between Palisade 2 and Ditch 5 was very narrow. Ditch 5 was only encountered in Trench 2, and only in the western length of the ditch could a full section be excavated ([Illus 116](#) & [118](#)). This ditch was easily the largest of those excavated, being well over 5 m in width and around 3.2 m in depth. The profile of the ditch was V-shaped, narrowing to a steep sided slot at the base ([Illus 116](#) & [118](#)). There were four gravelly fills, the lowermost of which contained frequent large stones in a black, highly organic dark orange–brown sandy silt

matrix. This lower deposit returned a radiocarbon determination calibrating in the range 730–390 cal BC (SUERC-27884), indicating that the ditch was cut and open broadly contemporaneously with the inner palisades. It is not clear where the upcast from the excavation of this bank was deposited– it is possible that it was located to the north of the ditch and retained by Palisade 2; this would imply that several of the features inside the enclosure, including pit (116) and postholes (111) to (113) predate this construction.



Illus 118. Section through Ditch 5

On initial identification, Palisade 1 (comprising cuts (122) and (120)) was thought to represent an earlier phase of enclosure which was subsequently cut by the excavation of Ditch 5. Palisade 1 was of very similar character to Palisades 1 and 6, with a similar U-shaped profile. A radiocarbon date for the fill of cut (122), however, places it at the later end of the sequence, perhaps suggesting that Palisade 1 was rather a modification and rebuild of the entrance through Palisade 2. Clearly, all of the palisade slots found around the entrance through Palisade 2 could not have functioned together, but any combination of these features still produces a very restricted entrance to the enclosure. It is notable, however, that the dates for Palisades 1 and 2 are distinct from the bulk of the enclosure features, both calibrating in the region 400–200 cal BC, and may indicate a later

phase of activity, perhaps even following the partial or total infilling of Ditch 5.

The middle of the three palisades, Palisade 3, was of slightly different character to the others. The cut of the slot was of a similar depth to the other palisades, but unlike Palisades 2 and 6, which followed the contours of the hill, Palisade 3 turned outwards at the terminals, forming a gate 2.5 m in width, with a central posthole (104) presumably supporting a gatepost between the fences. A radiocarbon date was obtained from the fill of this posthole, returned at 760-400 (SUERC-27890).

Trench 4 was located near the crest of the hill, incorporating some of the S-facing slope running towards Trench 3. In the W of the trench, a palisade slot (601) was found, running on a similar N-S alignment to Palisade 6 in Trench 3, continuing into the N baulk but with a terminus to the S, so that if (601) was associated with Palisade 6, there was more than one entrance through the enclosure. Two other features (602) and (603), probably postholes, located near the S baulk, were the only other features in Trench 4.

Trench 6 was located near the crest of the hill on the interior of the site, incorporating some of the slope overlooking the excavated crannog site, Cults Loch 3. An area measuring 11 m by 15 m was stripped, and cleaned by hand. However, no archaeological features were recorded in the trench. Several gravel bands ran across the trench but on excavation these were found to be natural.

The sequence of enclosure

The general similarity of the fills of all of the features identified in Trenches 2 and 3 made the establishment of physical stratigraphy very difficult in the few instances where features clearly cut one another. The radiocarbon dates from the features are, similarly, of limited assistance in determining the sequence of construction; the large calibration ranges mean that most features fall in the 8th to 4th centuries BC range, with only the date for the central gate post in Palisade 6 perhaps offering a narrower span around the turn of the 5th/4th century BC, although the date for the fill of Palisade 6, to which the central gate post was presumably integral, calibrates in the range 750–400 cal BC, implying that the correct date may be at the earlier end of this range.

The date for Palisade 1, calibrating in the range 390 to 200 cal BC, causes some irregularities in the use of the radiocarbon dates in establishing the constructional sequence. The date would imply that the palisade, located just north of the E terminal of Ditch 5 belongs to

a relatively late phase of activity, post-dating the infilling of Ditch 5. Alternatively, Palisade 1 was only a short trench, perhaps dug during refurbishment of Palisade 2 and possibly equating to the recut of Palisade 2 represented by slot (128). As such, Ditch 5 could still have been open, with only the primary silts beginning to accumulate in the bottom of the cut when this refurbishment took place.

Interior features

The interior of the site contained a range of features relating to internal structures, but few of these could be arranged into a coherent pattern ([Illus 117](#)). Most features were found on the E side of the trench, cut through a very hard, compact orange-brown deposit containing occasional flecks of charcoal that covered most of the upslope and eastern areas of the trench. This was interpreted as an old ground surface, and on excavation of the negative features cut through it the natural could be seen clearly below, an orange compact sand/gravel mix. The effect of this arrangement was that features that appeared to be slight in plan often turned out on excavation to be quite substantial, and several of the postholes excavated were very deep. The W side of the trench was somewhat barer, with no features recorded between Palisade 2 and Palisades 3 and 4 in the NW corner of the trench.

The other features in Trench 2 comprised a series of postholes, some unconnected linear features and a large, charcoal-rich pit (116). The postholes ranged in depth and diameter, from smaller examples such as (156) with a charcoal rich fill, measuring 0.35 m in diameter and 0.15 m in depth up to larger examples such as (109), 0.62 m in diameter and 0.54 m in depth, with a fill which contained small fragments of burnt bone. Many of the postholes had large packing stones in their fill, some up to 0.15 m in diameter (eg postholes (102) and (111)), while posthole (107) had large packing stones and the remains of a possible post pipe. None of these postholes could be interpreted as a structure.

Several linear features were recorded on the E side of Trench 2; again, these could not be interpreted as structural from the area exposed by the trench. Feature (105) ran NE to SW for a length of 3.6 m and had a V-shaped profile, 0.32 m in depth. The fill was largely stone, some of which was heat shattered, in a matrix of dark orange-brown silty sand containing frequent charcoal inclusions. Again, the linear features could not be interpreted as a structure, and may instead represent small enclosures or other lightweight structures.

A large irregular pit feature (116) was also excavated. Cut through the deposits described above, the pit measured c 4.5 m in length and 2.85 m in width, and 0.53 m in depth. The sides were steep and concave but the base of the feature was flat. The pit feature had several fills, each of which contained frequent charcoal inclusions. The pit was also cut by a large circular posthole (119) and a linear feature (160), not visible on the surface. The latter was oriented NE to SW and was filled by large sub-angular stones in a mid red-brown sandy silt matrix. The purpose of the pit and the linear feature was unclear.

Within Palisade 6, in the interior of the site, an arc of pits and postholes was located just inside the palisade entrance. The fills of all these features were very similar, orange brown silty sands with frequent small stone inclusions. Occasional packing stones were encountered, and charcoal flecks were occasionally present throughout the fills. These postholes were distributed in a broadly curving pattern, approximately parallel to the course of the enclosure defined by Palisade 6; none were intersecting so that it seems probable that they were all in use concurrently. One of the pits, (347) produced a Neolithic date (see above) so it is possible, therefore, that some of the scattered pits and postholes in this area relate to the Neolithic activity on the site.

Environmental remains

Jackaline Robertson

Introduction

A small assemblage of charred macroplant, carbonised wood and burnt bone was recovered from the excavation at the promontory fort. All three assemblages were small and it was only by drawing all the environmental evidence together was it possible to address the specific questions raised during the excavation. The issues under consideration were identifying any activities related to agriculture and food production undertaken on site, if this is in fact a domestic site and how natural resources were exploited and whether this changed over time.

Charred macroplant remains were recovered from 22 of the samples collected. The macroplant assemblage was small and preservation ranged from poor to good. The charred remains were dominated by caryopses of barley (*Hordeum* sp), emmer (cf *Triticum dicoccum* L), spelt (cf *Triticum spelta* L), bread/club wheat (*Triticum aestivum*type),

wheat (*Triticum* sp), oat (*Avena* sp) and cereal (*Cerealia* indet). The only other species recovered were hazelnut shell (*Corylus avellana* L), grass (cf *Gramineae*) and sedge (*Carex* sp) and these were confined to four contexts.

Carbonised wood larger than 4 mm was retrieved from 36 contexts of which over 600 fragments were identified to species. The assemblage was dominated by oak (*Quercus* sp.) which comprised 51%, with 29% hazel (*Corylus avellana* L.), 10% birch (*Betula* sp.), 7% apple/pear/hawthorn/quince (*Maloideae* sp.) and 1% each of willow (*Salix* sp.), pine (*Pinus* sp.) and alder (*Alnus glutinosa*). The charcoal assemblage contained small fragments of roundwood and twigs but there were no worked wood offcuts.

The burnt bone assemblage was small and poorly preserved and none of the 238 fragments could be identified to either species or element. The material has been designated as indeterminate mammal and quantified by weight. There was no evidence for surviving butchery or pathology. No fragments were larger than 20 mm and most were 10 mm or smaller. Most contexts contained ten or less fragments and in some instances only a single fragment was recorded. Only those features which contained a significant amount of burnt bone are discussed below.

The data is tabulated in [Appendix 5](#).

Results summarised by feature and material type

Palisades

Macroplant: A single context from Palisade 3 produced a small quantity of charred barley, wheat, oat and hazel shell. This was the only deposit from which oat was recovered, although it could not be identified as either the cultivated or wild variety. One context from Palisade 2 a small quantity of barley caryopses and two others produced a small quantity of charred wheat and indeterminate cereal. A single sedge nutlet was collected from the fill of the baffle wall (145).

Charcoal: Charcoal from Palisades 1 and 2 produced a mix of species including oak, hazel, apple/pear/hawthorn/quince and birch. These were concentrated in slots (122) and (127) and accounted for 20% of the total assemblage.

Synthesis: These environmental remains are probably re-deposited domestic waste and fuel debris which was backfilled into this feature.

The cereal remains and charcoal appear to have derived from domestic activities such as cooking, cleaning and fuel debris. The recovery of a single sedge is in itself not particularly informative, but this species could have been used as a fuel source.

Ditches

Macroplant: The charred plant material recovered from Ditches 1 and 2 (121), (129), was barley, wheat and indeterminate cereal caryopses. No deposit contained more than ten caryopses and these remains had noticeably poorer preservation when compared to other features on site.

Charcoal: Three contexts from Ditches 1, 2 and 5 produced small quantities of oak, hazel, birch, alder and apple/pear/hawthorn/quince charcoal including roundwood fragments. The charcoal accounted for 9% of the total assemblage and was spread throughout the deposits with no obvious evidence of selective disposal between the fills.

Synthesis: The poor preservation of the cereal caryopses indicates that this material has undergone re-deposition and re-mixing which have resulted in the abrasion of these plant remains. The charcoal remains are perhaps representative of fuel debris rather than structural burning, but the small number recovered demonstrates that at no stage was this feature the primary receptacle for fuel or domestic waste. Instead the accumulation of this assemblage is probably the result of incorporation during the infilling of the ditches.

Linear features, Trench 2

Macroplant: Charred macroplant were recovered from deposits in two linear features (103) and (110), and these were mostly concentrated in (110). This context contained a large quantity of barley, emmer, spelt and wheat. The only remains identified in (103) were a small number of barley caryopses and hazel shell.

Charcoal: The linear features (103), (105) and (110) each contained small quantities of two or more charcoal species including oak, birch, hazel, apple/pear/hawthorn/quince and willow.

Synthesis: The fills of features (103) and (110) contained both food remains and charcoal reminiscent of fuel debris. The remains from these features are representative of domestic waste in the form of cooking, cleaning and fuel debris which was probably backfilled into these linear features.

Pits

Macroplant: A small quantity of barley and cereal were recovered from pits (116), (307) and (315). These were mostly poorly preserved and abraded.

Charcoal: The charcoal identified in pit (116) consisted entirely of hazel which formed 4.2% of the total assemblage from the site. Most of these fragments were roundwood and were generally between 5 mm and 10 mm in size. The charcoal assemblage recovered from pits (301) and (315) contained a mixture of oak, hazel, birch, willow and apple/pear/hawthorn/quince. Oak and hazel charcoal were also recovered from the Neolithic pit (347).

Synthesis: The species uniformity of the hazel recovered from pit (116) is the best indicator of structural burning on site of a small discrete structure such as a wattle screen. The remaining pits contained remains representative of domestic waste.

Postholes

Macroplant: Charred macroplants were recovered from six postholes, (102), (104), (111), (109), (119) and (318). The plant material was dominated by cereal but a single grass caryopsis was recovered from (102). The cereal remains were concentrated in posthole (104) which contained a large quantity of barley, emmer, spelt, bread/club wheat and wheat. The wheat could not be identified to species but there were some morphological features more suggestive of either emmer or spelt rather than bread/club wheat.

Charcoal: Fragments of oak, hazel, birch, apple/pear/hawthorn/quince, willow and alder, some of which were roundwood were recovered from post holes (102), (104), (107), (108), (109), (111), (119) and (318). Postholes (102) and (119) contained two or less species whereas the remainder of the features contained between three and five different species.

Burnt bone: The burnt bone was concentrated in postholes (602) and (104), each containing 45% and 15% respectively of the total assemblage from the site. The bone was extremely fragmented with most fragments smaller than 10 mm. Most of the fragments were completely calcified, although a few were only partially burned white with residual black and grey discoloration surviving. This indicates that these remains have been exposed to different temperatures.

Synthesis: The charcoal from the postholes is typical of a fuel assemblage. The mixed species present in every posthole suggests that the material recovered does not represent the *in situ* burning of stakes or posts. The charred food debris recovered from the post holes suggests that the assemblage represents domestic waste which has

been allowed to accumulate probably on floor surfaces before being re-deposited into the post holes.

Trench 5; Bronze Age deposits

Charcoal: Charcoal was the only environmental material recovered from the possible remnants of the Bronze Age bank, (504). The species identified were apple/pear/hawthorn/quince, alder, birch, willow and pine including roundwood and twigs which accounted for 3% of the charcoal assemblage. A single fragment of oak and one of apple/pear/hawthorn/quince were found in Palisade 7.

Synthesis: It is notable that oak and hazel, which are the dominant species in the overall assemblage, are not present in the bank deposit, and only a single piece of oak was found in Palisade 7. This was also the only feature from any of the excavated Cults Loch sites from which pine was recovered. This slight difference in composition between the Bronze Age and Iron Age deposits might indicate either a change in local woodland cover or exploitation of different woodland stands. The mixture of five wood species is usually interpreted as indicating fuel debris which has become accidentally incorporated into the deposit. However, the absence of any other environmental material such as macroplant and bone suggests that this deposit was sealed off rapidly thus preventing domestic debris from becoming remixed into this feature.

Discussion

Macroplant remains

Charred cereal remains were scattered across the site, with significant concentrations in only two features, the linear feature (110) and posthole (104). There is no evidence of cereal processing or dumping of processing waste on any part of this site. The presence of a free threshing bread/club wheat caryopsis is of interest as this is a rare find in Iron Age Scotland. This same species has also been recovered from Cults Loch 3 and Cults Loch 5.

Apart from the hazelnut shell, the only other taxa recovered were small quantities of grass and sedge. These might be just weeds but they could have been deliberately collected for fuel and building materials (see [Chap 2c](#)).

Charcoal

It is difficult to interpret such small quantities of charcoal but the presence in most features of a mixture of species, together with trace amounts of macroplant and burnt bone do suggest that much of the charcoal represents fuel debris from domestic activities. The only exception to this is pit (116) in which the charcoal consisted almost entirely of hazel roundwood and which may represent burning of a small discrete structure such as a wattle screen.

Burnt bone

The burnt bone assemblage is small and most features were found to contain no more than 3% and most less than 1%. The bone was concentrated in two postholes (104) and (602) with 60% of the total assemblage recovered from these features. The abraded and fragmented condition of the bone assemblage is representative of material which has been remixed and re-worked into deposits. With the exception of the two post holes the remainder of the bone assemblage is indicative of backfilled re-deposited material, presumably deriving from domestic activities taking place on site, although the overall assemblage size is small.

Conclusion

The small size and poor condition of the ecofact assemblages limits their usefulness for fully understanding the economy and development of this site. By analysing the environmental material in conjunction with each other it was possible to draw certain conclusions about the nature of the site. The macroplant assemblage shows a society with access to a range of agricultural cereal products, including bread/club wheat which was probably an imported good. There is no evidence that this site was used for processing grain as no chaff and agricultural weed species were recovered, but as the assemblage is very small, this is inconclusive. The recovery of fuel debris along with the food waste suggests domestic rather than industrial activities, but the evidence overall is too insubstantial to indicate whether the site was used for domestic purposes.

The form and function of the enclosure

The vagaries of radiocarbon dating in the mid-1st millennium BC mean that it is impossible to be certain whether each of the palisades was sequential to its neighbour, and consequently it is not possible to establish whether the differences in style are the result of the

changing layout of the site, or due to functional differences. The slightly later dates for Palisades 1 and 2 might separate them from the earlier enclosures Palisades 3 and 6, and if the speculation that Palisade 2 retained the upcast bank from the excavation of Ditch 5 is correct, then the date for the primary infilling of Ditch 5 would tend to suggest that all of these features were broadly contemporary, probably erected around the mid-1st millennium BC.

The arrangement of the palisades or fences is not easy to interpret in functional terms. Clearly, the gates and baffle walls were designed to restrict direct access, or perhaps direct line of sight, through the entrances, and the gates were clearly not designed to accommodate wheeled vehicles. The practical reasons for these arrangements are unclear, but one explanation might be related to the control of livestock movement around the site: this could explain the need for the restriction of movement through the gates, while the out-turned terminals of Palisade 3 would be suited to the corralling of animals for shearing or milking.

This relatively prosaic explanation for the lightweight fences surrounding the promontory, however, sits uncomfortably with the scale of the defensive ditches that were apparently constructed either at the same time as, or shortly after, the palisades themselves. If protection of livestock was the only requirement of the enclosure, then presumably one ditch, particularly of the scale of Ditch 5, would have sufficed. The requirement of no less than five additional ditches (and presumably associated banks) surely demonstrates that the site had greater importance than as a simple stock enclosure. The scarping technique used to accentuate the steepness of the slope surrounding the promontory must have involved considerable effort, while the clean white subsoil exposed by this work (visible in [Illus 111](#)) would have created an impressive mark on the landscape.

Excavation of Trenches 4 and 6 in the interior of the site aimed to locate any domestic structures or other buildings that might help elucidate the nature of the site, but all that was uncovered was a short linear palisade slot in Trench 4. The lack of archaeological remains in these trenches, combined with the evidence for the complete destruction and erosion of the early-phase rampart found in Trench 5 suggest that the site has been heavily eroded by ploughing, perhaps to the extent that features located in the interior have been completely lost. It is possible that only in the downslope areas, ie in Trenches 2 and 3, where cut features were protected by deeper topsoil accumulation, do archaeological features survive. The heavy truncation of the site by ploughing might also account for the lack of

any surviving material culture; were any artefacts to survive this destructive process, they would be likely only to be found in the base of the perimeter ditches, and these were only investigated in a few very limited slot trenches. The environmental remains recovered from the bulk samples tend to lead towards the view that there was domestic activity on the site, with the majority of sampled deposits producing charcoal, cereals and/or burnt bone which might be taken to indicate cooking on site.

The promontory fort demonstrates clearly the difficulty involved in assigning reliable dates to cut features and forming an absolute chronology on the basis of samples from their fills. Critical to this issue is the presence of a level of ‘background’ activity from the earlier Neolithic onwards at the promontory, and the security of the charcoal extracted from the fills of the features dated. The difficulty in providing an accurate date for a cut feature using the date of its fill is a familiar one, but the significance of the effect of insufficiently critical use of radiocarbon dates is clearly apparent in the settlement archaeology of the late Bronze and early Iron Age. Halliday has recently drawn attention to the frequency with which late Bronze Age dates are produced by sites which otherwise appear to be occupied in the pre-Roman Iron Age, interpreting the late Bronze Age dates from Standingstone in East Lothian (Haselgrove 2009) as residual from a phase of unenclosed settlement prior to the Iron Age defence of the site (Halliday *forthcoming*). The chronological model for the occupation and abandonment of Cults Loch 4 is developed by Hamilton in [Chapter 6](#), but it is important to note here the uncomfortable reality that the radiocarbon dates from the excavated features are of little assistance in establishing the precise date of fortification, beyond establishing that the bulk of activity that contributed the carbonised material dated was deposited after the mid-1st millennium BC. Any other evidence for a phase of later Bronze Age settlement at Cults Loch 4 is not forthcoming, but given the apparent loss of most of the internal features of the fort to ploughing this could not be ruled out.

Inland promontory forts

The Cults Loch fort is somewhat unusual in its inland promontory location, although coastal promontory forts are a well known and numerous feature of the Iron Age settlement record of the region (Toolis 2003; 2007). Two other sites offer comparanda for Cults Loch 4. At Drummoral near the Isle of Whithorn in the Machars (NX43NE

1), an inland defended enclosure makes use of the natural topography to define an enclosure, cutting off a spur of land with a 10 m wide ditch. Unlike at Cults Loch 4, Drummoral overlooks lower ground and is not surrounded by water, but the design of the site is otherwise similar. Likewise, at Kemp's Graves in the Rhinns (NX06SW 3) a complex of earthworks with medial ditches has cut off a steep-sided promontory in a fashion very similar to Cults Loch 4. The RCAHMS considered that Kemp's Graves was unlike any other prehistoric fortification on the Rhinns, and that the date should therefore be considered unknown, but the similarity with Cults Loch 4, itself somewhat unusual in the local context, would lend weight to its interpretation as an Iron Age settlement.

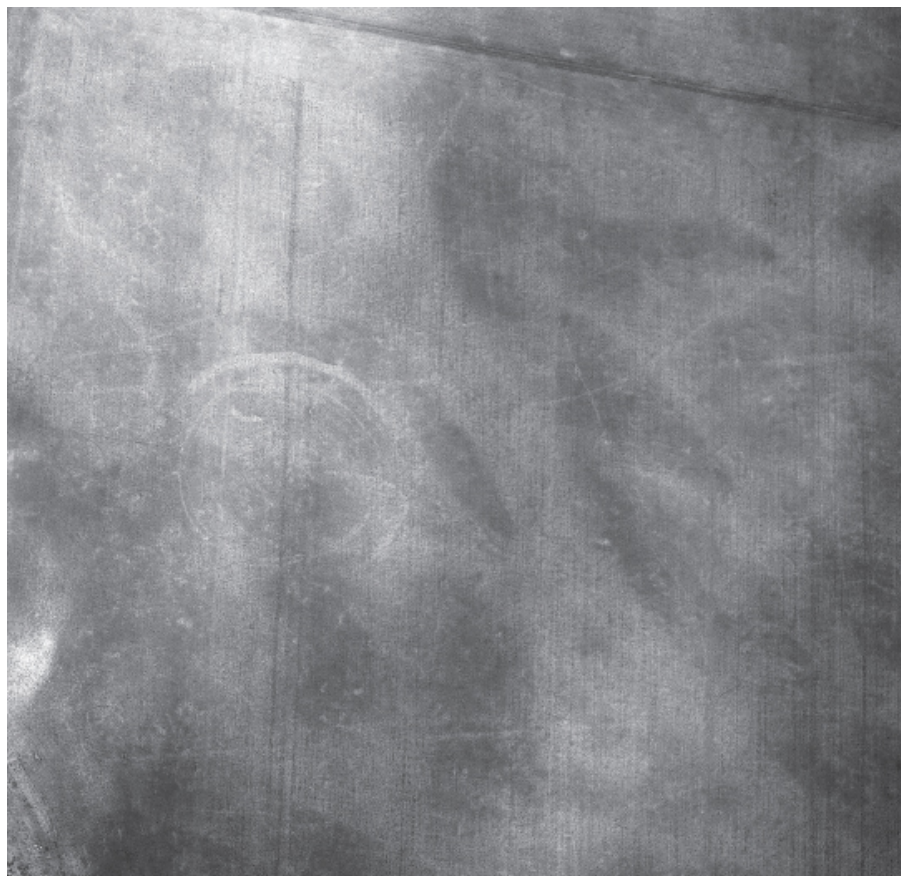
4 Cults Loch 5; the palisaded enclosure

Introduction

The enclosure at Chlenry Cottages (NGR: NX 1232 6050; NMRS No: NX16SW 24) was first recorded during aerial reconnaissance work in the late 1970s, and is listed in Truckell's catalogue of newly identified sites published in 1984 (Truckell 1984, 201). Located around 400 m SSW of the cottages at Balnab, the enclosure occupies the flat terrace of land to the north of Cults Loch, now used as pasture and divided into large fields by drystone dykes. Topographically, the ground is virtually level, and offers no natural defence. Indeed, there is little to indicate the logic behind the choice of position, other than the choice of the flat, easily cultivable land to the north of the loch in general. The site has a view of the loch, but it is unlikely that this was a primary concern, since other areas of the same plateau provide a better aspect of a larger proportion of the water.

The 1978 aerial photographs show clearly the palisade slots of an enclosure which is very nearly circular with a diameter of 42 m. The slots are spaced consistently 1 m apart, and on the latest transcription there are several interruptions around the circuit, on the N, S and E sides of the enclosure. To the N of the enclosure, and surrounding approximately half of its circuit is a ditch averaging 2.7 m in width, but widening to around 5 m in width close to what is probably the eastern entrance to the site. On the 1978 aerial photographs, an extension of the southern terminal of the innermost palisade slot appears to run into the interior of the enclosure, as though forming one side of a fenced passage into the site, although in a later transcription of the photographs by the RCAHMS, this feature has been removed ([Illus 119](#)). Preservation appears to be somewhat less complete on the south side of the site on the basis of the visibility of features in the cropmark photograph, although given the survival of the palisade in the southern half of the circuit it seems probable that

the ditch does not completely encircle the site, and may only be present on the N and SE sides. This hypothesis is supported by the rounded terminals on the northern ditch at its E and W ends, suggesting that these indicate the real ends of the feature.



Illus 119. Cults Loch 5; features visible in the RCAHMS aerial photographs taken in 1978 (© Crown Copyright: Historic Environment Scotland).

In the interior of the enclosure, the features are less distinct. RCAHMS transcribed a circular arrangement of pits close to the geometric centre of the enclosure. In 2007 a curvilinear negative feature was recorded in the NW quadrant of the interior, and interpreted as a souterrain. No other features were easily intelligible from the aerial photographic record.

Geophysical survey

Tessa Poller & Graeme Cavers

Geophysical surveys were undertaken at the site using gradiometry and resistivity.

Resistivity

An earth resistance survey of the site was carried out using a Geoscan RM-15 Advanced resistivity meter, using a 0.5m probe separation, taking readings on a 1.0 m interval separation. Readings were downloaded to Geoplot v3 and plotted as greyscale and trace plots.

Nine 20 m × 20 m geophysical grids were surveyed over the cropmark, at 1.0 m intervals, therefore providing 400 readings per 10 m square. The results of the survey are equivocal and do not clarify the details transcribed from aerial photographs, perhaps owing to the shallow depth of the topsoil over the site. However, the perimeter palisades are visible in the data, as are several areas of low resistance, denoting the presence of internal pits and other features.

Gradiometry

Gradiometry survey was carried out using a dual sensor Bartington Grad601, walking in 'zig-zag'. Using this technique data was collected in 20 m grid. Within each grid measurements were taken every 0.5 m along the traverse and sampled every 0.25 m. The total area surveyed was approximately 24,000 m².

The data was downloaded using Grad 601 software and imported into GeoPlot v3 for processing. In order to highlight the more subtle archaeological features the raw data was clipped at a minimum of -20nT and max of +20nT. To compensate for a drift in the data which happens when covering a large area quickly by walking in a zig-zag manner a 'zero mean' is applied on all grids. The 'zero mean' also processes the 'striping' effect of the data produced by a difference in zero balancing of the two sensors. Also due to the number of readings taken every metre there is a slight but consistent stagger in the results, which has been compensated by 'destagger' processing.

The enclosure visible on the aerial photographs appears to be represented by a narrow, circular feature of slightly negative magnetism 0.8 m in width ([Illus 120](#)). Only roughly two-thirds of a complete circle, with an overall diameter of 40 m, was detected. Towards the SE corner only a faint line may reflect the continuation of the palisade. On the western edge of this feature is a very strong dipole, which may be the response of a metal object, igneous stone or area of intense burning.

As recorded from the aerial photographs, about 3 m from the

palisade, on the N side, there is a concentric curvilinear feature characterised by a subtle negative band 1.2–2.0 m wide, which in places has a positive magnetic ‘halo’. Interpreted as a ditch, the magnetic response of this feature becomes more diffuse and appears to terminate at a strong dipole similar to the one coincident to the palisade described above. Surrounding these dipoles there is a spread of small anomalies of variable strong negative and positive readings, perhaps a scatter of heated material.

On the N side of the enclosure there is a very straight linear anomaly running in a W/NW to E/SE direction and appears to intersect or cut both the palisade and outer ditch. This was found on excavation to be a modern field boundary (Ditch 2, below). Another short linear feature, less than 0.5 m wide, is visible intersecting/cutting across the SW side of the palisade ditch. This too may be a relict drainage feature.

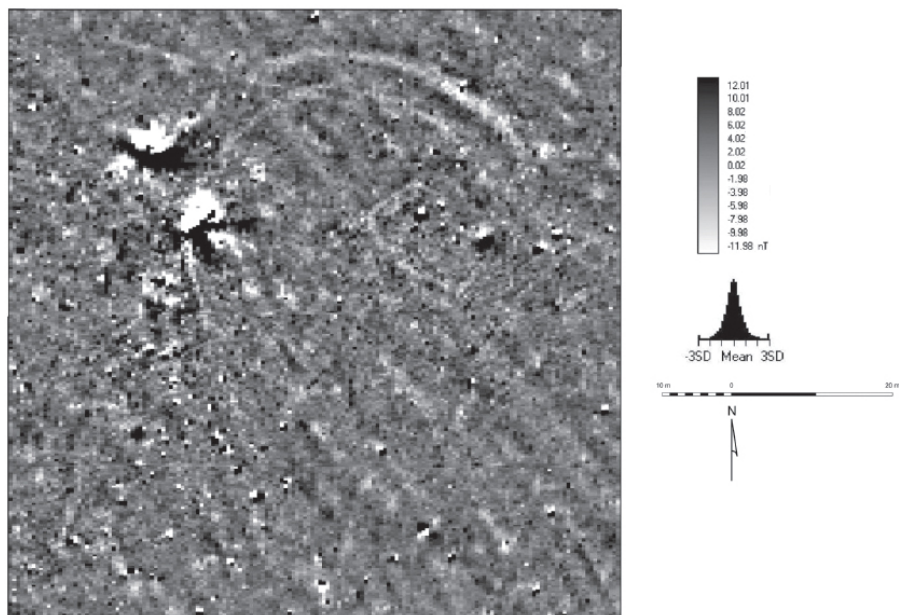
Within the interior of the palisaded enclosure the most distinct area of magnetic activity detected was in the eastern side. In this area there are two small dipoles and a concentration of positive anomalies. The traces of the evaluation trench excavated in 2009 can just be identified running from this area to the NE. Outside the enclosure, in the NE corner there are several subtle negative anomalies. These anomalies may be the response of pits or cut features but could also reflect isolated areas of soil accumulation derived from by agricultural activity.

Some plough lines are visible cutting across the surveyed area as variable bands of slightly negative and positive magnetic, running in a NW to SE direction.

Gradiometry results: discussion

In general the gradiometry results over the site of the palisaded enclosure confirmed the identification of many of the features previously recorded by aerial photography of cropmarks ([Illus 119](#)). The gradiometry survey highlighted a potential gap in the circuit of the palisade enclosure on the SW side, perhaps the result of poor preservation or a change in the soil composition of the palisade trench. Similarly the outer ditch is only recorded as a short segment on the N side of the palisade, in accordance with the impression given by the aerial photography. Interestingly, in the gradiometric survey the western terminal of this ditch appears to coincide with a strong dipole. Nearby, a second strong dipole is situated over the line of the palisade. These anomalies may reflect particular deposits associated with the enclosure. Within the enclosure a concentration of magnetic

activity associated with a structure was noted in the E end.



Illus 120. Magnetometry greyscale plot of Cults Loch 5

Excavation results

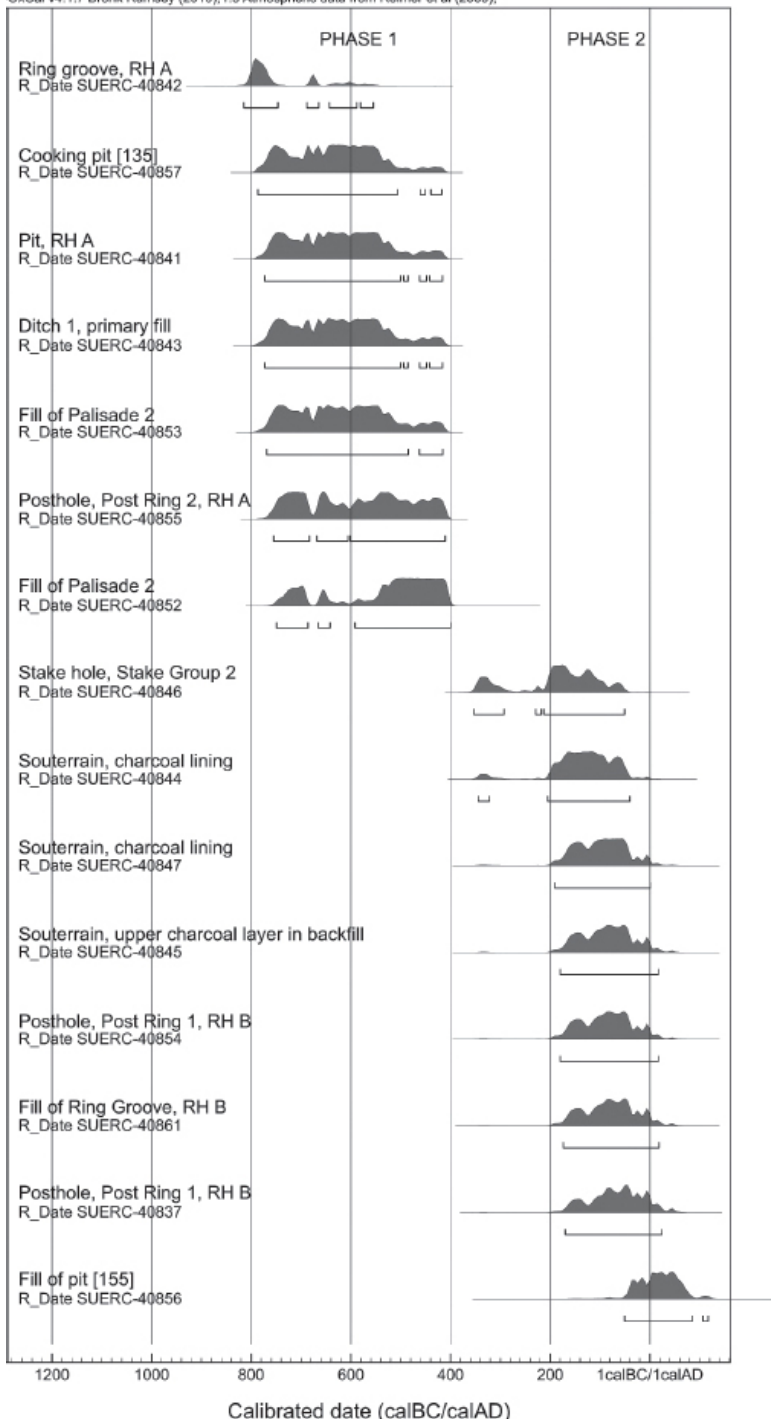
An evaluation trench was excavated at the site during the 2009 season of work at Cults Loch. At this time, the presence of the northern outer ditch, the two palisade slots, two interior ring-grooves and a range of pits and postholes was confirmed, although none of these features were excavated at that time. The site was returned to in November–December 2011, at which time around 33% of the enclosure was stripped of topsoil for excavation.

Scheduled Monument Consent was obtained for excavation of the northern half of the enclosure, with a trench designed to encompass the northern interior, possible ring-groove structure identified in the evaluation phase and the souterrain noted in the aerial photographs. Topsoil over the excavation area was stripped using a mechanical excavator and all deposits thereafter excavated and recorded by hand.

The radiocarbon dates from the site are presented in [Table 13](#) and [Illus 121](#). With the exception of a Neolithic pit, all the chronological evidence from the site points to two discrete phases of activity in the 1st millennium BC ([Illus 122](#) - see *Chronology* below).

Earlier prehistoric features

No indication of activity earlier than the later prehistoric enclosure on the site was recognised during the excavations, and there was nothing to suggest that the features within the trench related to anything other than the later prehistoric activity within the enclosure. However, post-excavation analysis demonstrated that a single pit, (235) within Roundhouse B ([Illus 130](#)) was of Neolithic date, returning a C¹⁴ determination calibrating in the range 3370–3090 cal BC (SUERC-40851). The pit had drawn attention during excavation since it produced several sherds of coarse pottery – a very rare find from a later prehistoric settlement in SW Scotland – as well as a large number of hazel nut shell fragments. The earlier prehistoric date probably explains the presence of pottery in this feature, while the high proportion of hazel nut fragments were similarly out of character for the site. No other evidence of activity from this period was recovered, however, and pit (235) is considered an isolated anomaly.



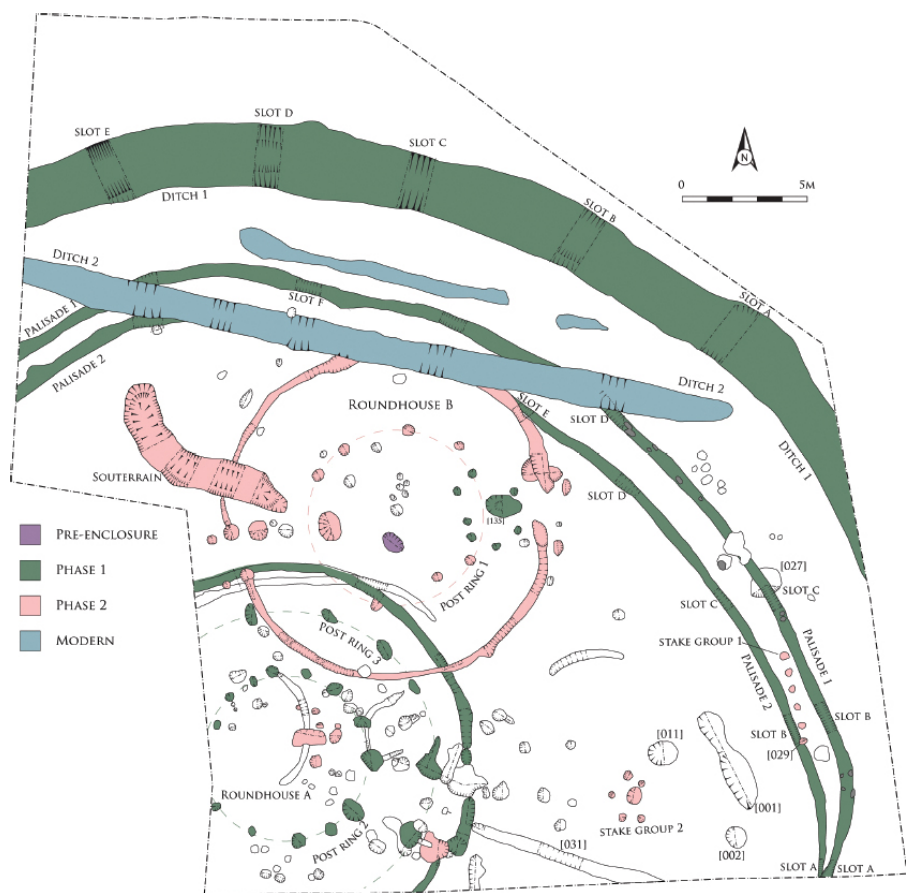
Illus 121. The radiocarbon dates for *Phase 1* and *Phase 2* activity (graph produced using OxCal v4 1.7 Bronk Ramsey 2010; r:5 Atmospheric data from Reimer et al 2009)

Phase 1

Enclosure: the ditch and palisades

The site was enclosed by a single ditch and double palisade, which from the curvature of the excavated areas would have enclosed a circular space 53 m in diameter within the ditch ([Illus 122](#)). The aerial photographs suggest that the entrance to the enclosure, through both the ditch and palisades was to the E, although the area opened for excavation only just clipped the terminus of the palisades. The N terminus of the ditch was not located within the area excavated. No other breaks in the palisade, suggested by the RCAHMS photographic transcription, were found in the excavated areas of the palisade.

The ditch was consistently around 2.5 m in width, varying very little along its length. Five slots were excavated along its length, each showing a similar profile in section ([Illus 123](#)). The ditch cut was a broad U-shape in profile, with steeply sloping sides both inside and out, and a flat base. The ditch had in-filled with sand and gravel eroded from its sides (034), before being re-cut with a steeper V-shaped profile. That cut in turn was filled by a darker, more organic sandy fill (035) and an upper, lighter sandy gravel (037). All three fills were clean, with very little anthropogenic material; no finds were recovered from any of the excavated slots.

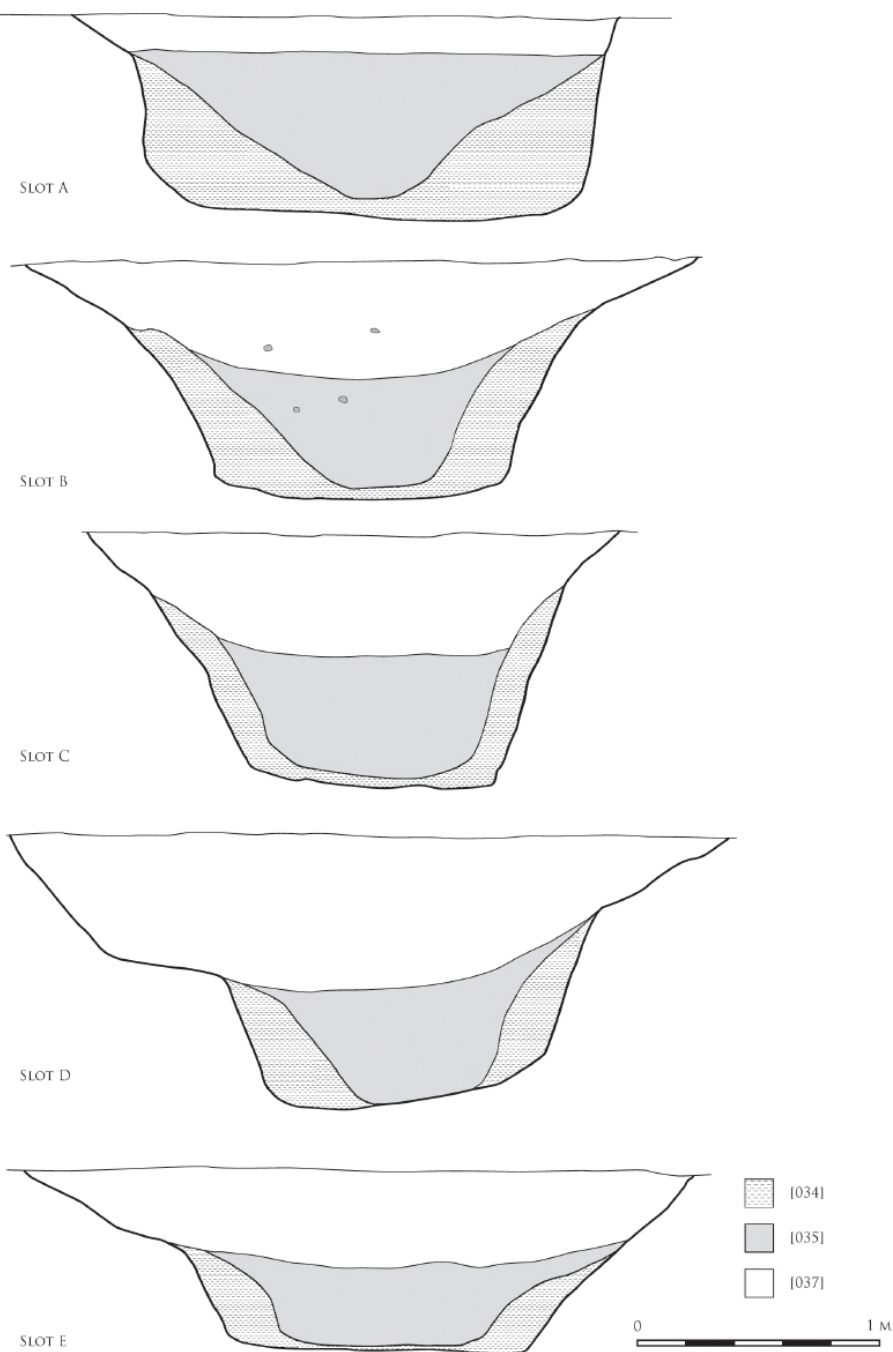


Illus 122. Phased plan of the excavated features

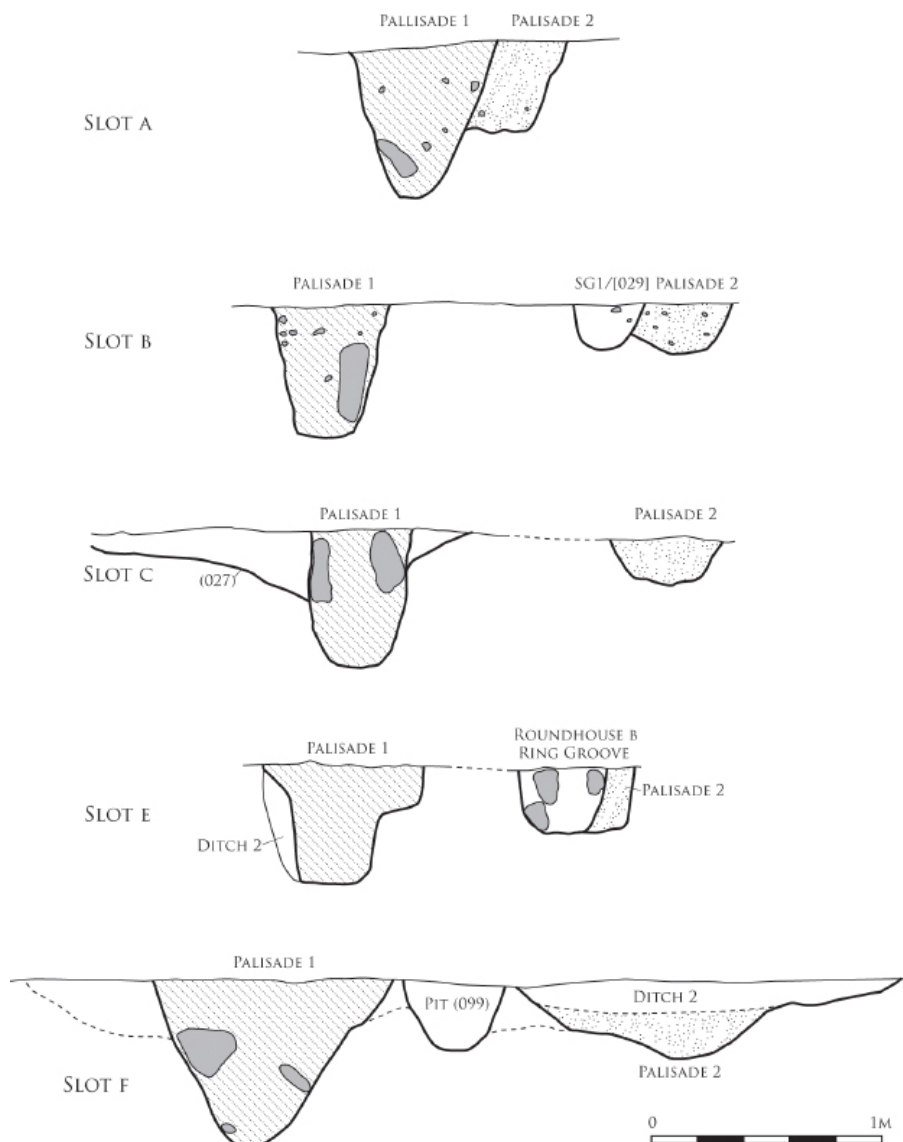
There were no direct relationships between the ditch and any other features in the trench, although the close concentricity of the ditch and inner palisades implies that these features were designed together. The palisade slots themselves were closely parallel, converging only at the S extent of the trench where they presumably formed an entrance into the enclosure. The outer of the two slots, Palisade 1, was 0.65 m in depth and deeper by c 0.20 m than the inner Palisade 2, and at the point where they converged (Slot A), the outer slot cut the inner (Illus 124, Slot A). Although this relationship demonstrates a sequence in the cutting of the palisade slots, the close concentricity of the two cuts suggests at least that Palisade 2 was still visible when Palisade 1 was cut, but that possibly they were cut together. The fills of both palisades were very similar, containing coarse sandy gravel and occasional packing stones up to 0.15 m in diameter.

A few other features were associated with the palisade slots in the SE area of the trench. These included Stake Group 1, a linear arrangement of stakeholes running N-S across the palisades. The

southernmost of these, (029), cut Palisade 2 (Illus 124, Slot B), demonstrating that the alignment post-dated the inner palisade, but the stakes stopped short of Palisade 1 so that the relationship with this slot could not be established. Several other features to the N of Stake Group 1, including a circular pit (027) pre-dated the cutting of Palisade 1 (Illus 124, Slot C).



Illus 123. Sections through Ditch 1



Illus 124. Sections through Palisades 1 and 2

In Slot E, through Palisade 2 and the ring-groove of Roundhouse B (174), it was demonstrated that Roundhouse B (see below) cuts Palisade 2, so that the inner palisade slot must pre-date Roundhouse B.

Two non-contemporary ring-grooved roundhouses were present within the enclosed area, Roundhouse A in the SW corner of the excavated area and Roundhouse B to the north. (During fieldwork, the roundhouses were labelled Roundhouse 1 and Roundhouse 2, with the northernmost structure being RH1, and the southernmost being RH2. These labels have been altered for the sake of clarity in the

chronological re-ordering of this report, so that Roundhouse 1 is now Roundhouse B, and Roundhouse 2 is now Roundhouse A. A note is included in the site archive to establish this.)

Roundhouse A

Roundhouse A was located close to the centre point of the enclosure ([Illus 122](#)). Around two thirds of the roundhouse was exposed within the excavated area, revealing a ringgroove (124), 14 m in diameter with a central circular arrangement of eight postholes within the interior (Post ring 2), with a diameter of 7.2 m ([Illus 125](#) & [126](#)). Although relatively shallow, when the effect of plough truncation is taken into account it seems probable that this central ring was a principal weight-bearing structure within the building. A second group of postholes located just inside the ring-groove may have formed a further post ring (Post ring 3), between the inner post ring and the outer wall of the building. In general, the postholes of Roundhouse A were better preserved than elsewhere, surviving to up to 0.40 m in depth in places. The fills of the pits and postholes in Roundhouse A were generally darker and more charcoal rich than those in Roundhouse B, frequently containing charcoal fragments and burnt bone, and regular packing stones ([Illus 127](#)); otherwise they were very similar in character to those of Roundhouse B.



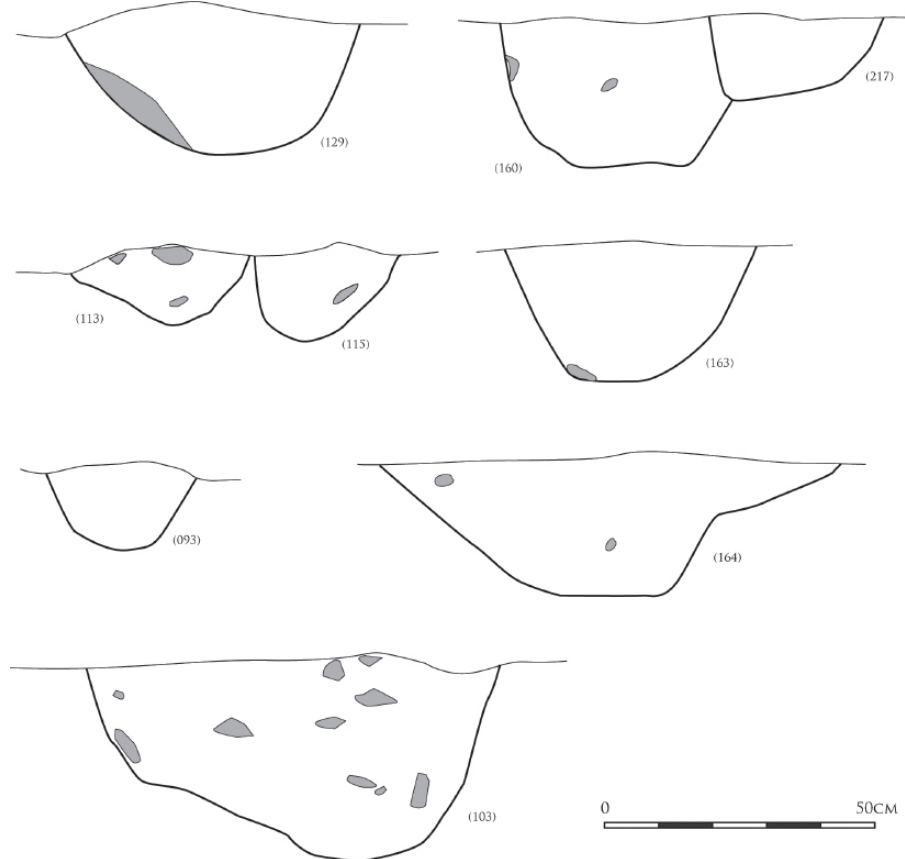
Illus 126. Roundhouse A prior to excavation

The interior of Roundhouse A was confused by a collection of further pits and postholes that could not easily be related to the structure. The NE quadrant of the building was particularly complex, with several small pits and postholes with no clear purpose. Again, the fills of these features were relatively organic, containing frequent evidence of burning. Similarly, two other features, curving linear gullies within Roundhouse A, could not easily be interpreted. The westernmost of these gullies (281), terminated to the N in a posthole that may have been part of internal Post ring 2. Similarly, gully (087) was cut by later pit (122), suggesting that the curving gullies may have been contemporary with the earlier use of the building, possibly representing internal division within the house. Gully (281) was cut by a later pit (213), which was similar to (135) in Roundhouse B and Stake Group 2 (discussed below) with a similar fill containing a large quantity of charcoal and burnt bone. Like pit (135), (213) was surrounded by small stake holes, and it is possible that this group represents a similar cooking pit and associated structure (see below), post-dating the original internal features of Roundhouse A, and possibly belonging to [Phase 2](#) activity contemporary with Roundhouse B.

Other indications of domestic occupation came in the form of several sherds of coarse pottery, undecorated and generally non-diagnostic, but different in character from the somewhat finer sherds recovered from pit (235) discussed above. It is probable that these sherds represent rare examples of Iron Age pots; very few later prehistoric sites in SW Scotland have produced similar material (see

discussion below).

The entrance to Roundhouse A was relatively complex, much more so than either of those in Roundhouse B, and several pits and slots had been cut and re-cut across the original features. Many of these features merged into one another, and with their fills being very similar it was difficult to disentangle the sequence. A radiocarbon date for pit (155), cut through the S terminal of the ringgroove, returned a radiocarbon date that places it in the [Phase 2](#) activity on the site, perhaps contemporary with Roundhouse B and therefore post-dating the use of Roundhouse A. It seems likely, however, that at least some of these cut features were related to the elaboration of the entrance area in Roundhouse A, perhaps forming a porch area or passageway into the building. Four large pits surround two central post-holes in the entrance to the roundhouse ([Illus 128](#)), suggesting a structure supported by heavy posts, with a 'gated' doorway. The purpose of the linear feature (089) was not clear, as it seemed to block the entrance to the building. The feature was filled by large packing stones which at the N end were arranged around a central post pipe, indicating that the feature was a bedding slot for a post-built screen or fence. The purpose remains unclear, although interestingly, similar 'baffle' screens were apparently built across the entrance of the promontory fort, Cults Loch 4.



Illus 127. Selected sections through features within Roundhouse A

Associated with Roundhouse A was a curvilinear cut (249), on the N side of the roundhouse and crossing the ring-groove (124). Although on initial identification this appeared to represent a re-cut or earlier phase of the ring-groove, the path of this feature was in fact much straighter than the ring-grooves, so that it is more likely that (249) represents a feature unrelated to the roundhouse. Excavation demonstrated that (249) cut (124) however, so that this feature must have been created after the abandonment of Roundhouse 2, although prior to the construction of Roundhouse B.

Phase 2

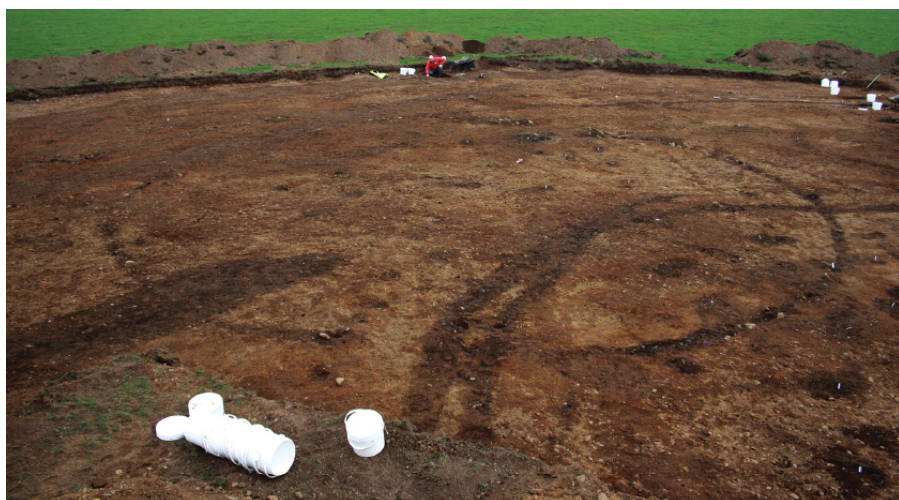
Roundhouse B

Roundhouse B was fully uncovered ([Illus 129 & 130](#)). It was located close to the centre of the excavated area and overlapped the N perimeter of Roundhouse A. The ring-groove (174) was 13.5 m in

diameter and averaged 0.25 m across; it was 0.2 m deep in the N, but considerably shallower in the S and W areas where it was only a few centimetres deep, probably as a result of plough truncation. For the most part, the base of the ring-groove was shallow concave, with no obvious signs of postholes, although in the SW quadrant (Slot F) the base dipped in stretches of c 1 m, as though posts or planking were inserted in sections (*Illus 130*). There were two entrances into Roundhouse B, one to the E and the other diametrically opposed to the W, the groove terminating in a large round posthole at each entrance (*Illus 132* & *133*). Associated with each terminal at both entrances was a further posthole suggesting the presence of a ‘porch’-like enhancement of the entrances.

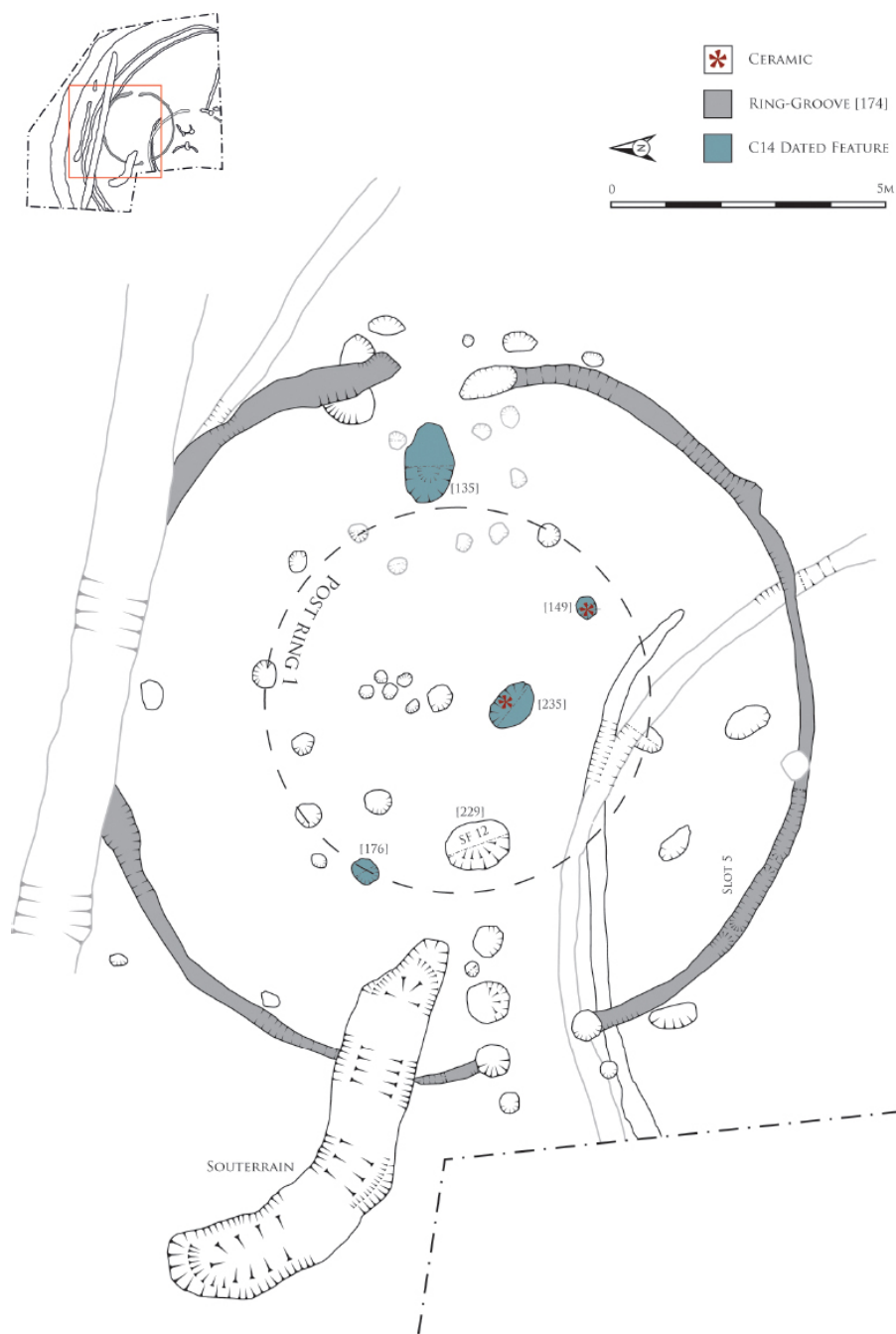


Illus 128. Pits [127], [131] and [087] in the N terminal of Roundhouse A



Illus 129. Roundhouse B, prior to excavation. The dark cropmark to the left is the souterrain prior

Within the interior of the roundhouse there was a series of pits and postholes. Eight of these appeared to comprise an internal ring of posts (Post ring 1), with a diameter of 7 m. These postholes averaged around 0.4 m deep and their fills contained packing stones up to 0.2 m in diameter, and like those in Post ring 2 in Roundhouse A, seem likely to have been the principal weight bearing posts of the building.



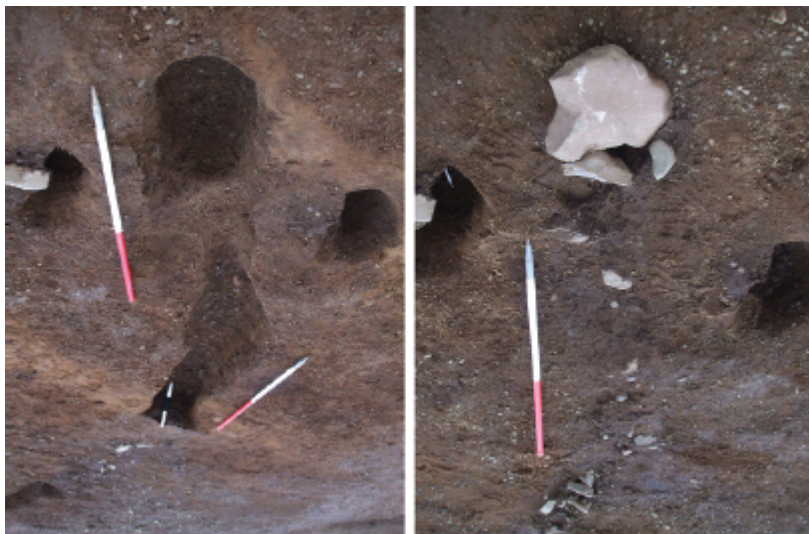
Illus 130. Plan of Roundhouse B.



Illus 131. Roundhouse B ring-groove, Slot F, showing groove 'slots'



Illus 132. Roundhouse B, W entrance N terminal and 'porch' posthole



Illus 133. Roundhouse B, E entrance, S terminal before (left) and after (right) excavation



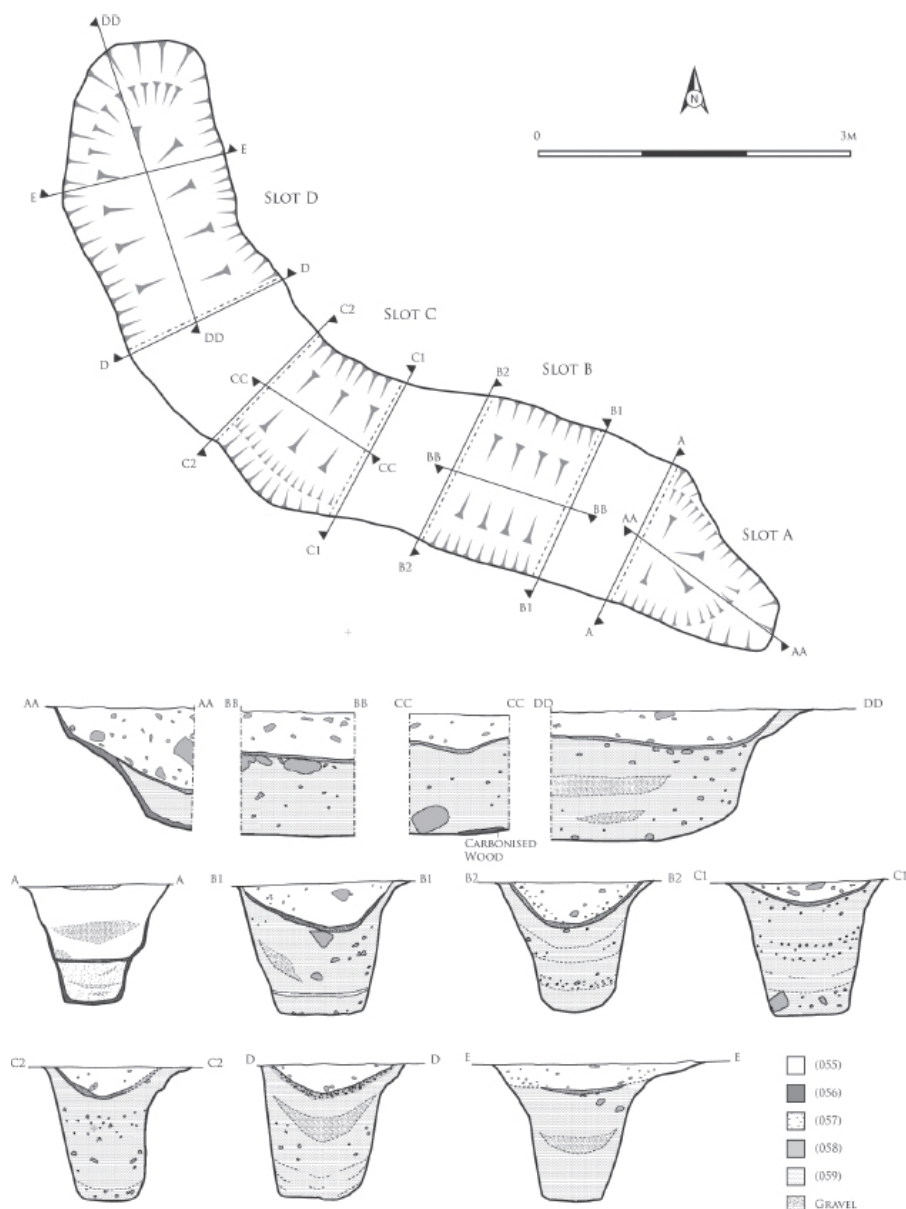
Illus 134. Souterrain, post-excavation

Other features in the interior of Roundhouse B included a scatter of small pits or postholes, one of which (229), produced a fragment of broken rotary quern (SF12), the corresponding stone of which was found within the lower fill of the souterrain (see below).

The souterrain

The souterrain identified on aerial photographs was located in the NW area of the trench, lying within the footprint of Roundhouse B ([Illus 129](#) & [130](#)). Prior to excavation the feature was visible as a dark, curvilinear cut 9 m in length with the longest section oriented NW/SE. The entrance into the souterrain was from the E, where the cut

stepped down 0.45 m to the base, at 1.3 m in depth. The sides of the cut were near vertical, though slightly shallower at the top of the feature, where it widened to a maximum of 1.7 m across. The base of the feature was shallow concave, and virtually level along its length (Illus 134 & 135).



Illus 135. Plan of and sections through the souterrain.

Approximately 66% of the deposits within the souterrain were excavated. The uppermost fill (055) was a silty sand containing

frequent stones, some of which were up to 0.25 m across. There was no obvious structural function of these stones, but a group of them was present at the base of (055), visible in Slot B, which might suggest they were incorporated in a structure above ground level, which subsequently collapsed into the souterrain. The souterrain was evidently timber-lined, the lining represented by a 30 mm thick black, charcoal rich sandy silt (056) lining the cut at the entrance end of the feature ([Illus 135](#), Slot A & [Illus 136](#)). At the base of the 'step' within the entrance, this charcoal layer encased a 30 mm deep block of orange-red, heat-affected sand (057) containing frequent lumps of charcoal ([Illus 135](#), Slot A). The origin of this deposit was not clear, but it did not extend into the souterrain further than the base of the step in the cut, and it is possible that it represented a step, retained by the timber lining.



Illus 136. Section through the souterrain fill in Slot A, showing the burnt sand 'step' retained by the timber lining, indicated by a thin layer of charcoal

The timber lining deposit was not continuous throughout the souterrain, and did not appear in Slots B, C or D, although in Slot C, a rectangular patch of charcoal on the floor of the souterrain may represent a plank fragment burnt *in situ* (Illus 137). The majority of the remaining souterrain fill was coarse sand and gravel (059), for the most part undifferentiated although several thick lenses of gravel were present within this deposit. Occasional charcoal fragments were

present throughout, but the only other find was a broken rotary quern stone (SF8), lying on the floor of the passage in Slot B ([Illus 138](#)).

The upper fill of the souterrain contained a thin layer of charcoal-rich sandy silt (058), which ran along the length of the passage, on average around 0.40 m below the top of the souterrain. This burning layer must have been deposited after the souterrain had been in-filled, since the interfaces with the main fills below and above were clear. It seems probable, then, that the souterrain was already abandoned or deliberately backfilled by the time the burning represented by the upper charcoal layer occurred. It furthermore seems probable that the timber furnishing of the interior was intact and buried by gravel backfill when the burning episode occurred that converted it to charcoal, since it is otherwise hard to see how this charcoal layer could have remained in position on the sheer sides of the cut.

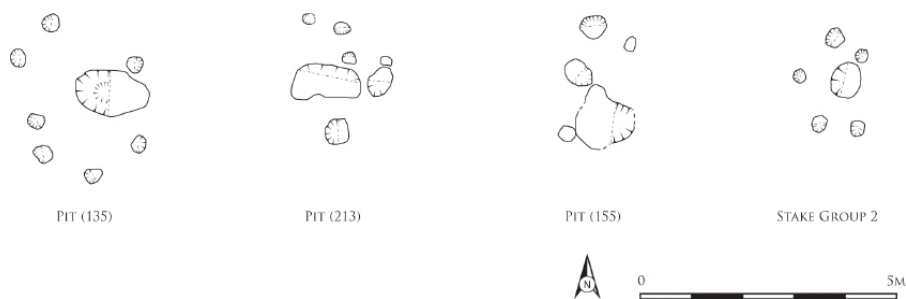


Illus 137. Fragment of carbonised timber beside a granite boulder in the base of the souterrain



Illus 138. Broken rotary quern fragment, SF8, in the base of the souterrain

The only other finds, a fragment of flint (SF2), and a possibly worked stone (SF3) came from the upper fill of the souterrain (055) and therefore must be considered effectively residual.



Illus 139. Stake groups and pits possibly representing cooking structures found across the excavated area

Re-cut of the ditch

In [Phase 2](#), the ditch was recut. In most of the excavated sections this gave the ditch a similar profile to the original cut, but in Slot A the recut (033) was a much steeper V-shaped profile ([Illus 123](#)). The fill of the re-cut ditch (033) was similar to the earlier fill, though it was somewhat darker and more organic. The recut of the ditch along the same alignment as the primary cut confirms that the ditch must have been visible as a pronounced hollow surrounding the dilapidated bank at the time of the [Phase 2](#) reoccupation.

Other features within the enclosure

A range of other small features were excavated within the enclosure. Most of these were isolated pits or postholes that could not be interpreted as having any clear function. However, a series of features that consistently stood out in the stratigraphic sequence was a number of small pits, often surrounded by a small collection of stakeholes ([Illus 139](#)). Two of these have been described above, where they were found within Roundhouses A and B, cut by features of the building, indicating that they were not in use within the structures, and may not have been enclosed at all. Stake Group 2 ([Illus 139](#) & [140](#)) was a further example, a collection of small stake holes surrounding a shallow pit located close to the likely entrance to the enclosure in the SE corner of the trench. The fill of pit the central pit in Stake Group 2 was very rich in charcoal, suggesting it had been the site of a hearth. The fills of nearby pits (001), (002) and (011) were similarly rich in charcoal, so that this area of the site may have been dedicated to cooking or related activities. A charcoal-rich pit surrounded by stake holes just inside the eastern entrance of Roundhouse B, but radiocarbon dated to [Phase 1](#), had a similar arrangement. As outlined

above, pit (213), which cut several features in Roundhouse A, contained an assemblage typical of cooking debris, and may have been in use in [Phase 2](#), with Roundhouse B. It seems possible that each phase of activity in the enclosure included one or more of these cooking areas, as denoted by this characteristic pit and stake-hole arrangement.

A linear cut was investigated in the S area of the trench that may relate to internal subdivision of the enclosed space. The cut (031) had similar dimensions to Palisades 1 and 2, although it was much shallower, and it is not impossible that this feature represented a fence line or other lightweight division running from the enclosure entrance to the entrance to Roundhouse A. This gully terminated before the ring-groove of Roundhouse A, implying that the two features were contemporary.

Modern features

Two linear features, probably of modern origin cut across the excavated area. The southernmost of these (Ditch 2) was a shallow, flat-bottomed ditch that truncated the upper fills of both the palisade slots and the ring-groove of Roundhouse B ([Illus 124](#), Slot F). A narrower gully to the north was not excavated but the close correspondence between this feature and Ditch 2 suggests that they belong together. These linear features are most likely to relate to modern field boundaries transcribed by RCAHMS from aerial photographs. Slots were excavated across nearby features on a similar alignment during the evaluation phase in 2009, and modern material was recovered from the fills.

Chronology

Stratigraphy

The chronological relationships between the elements of the site described above were not always straightforward to establish at the time of excavation, due in part to the similarity of all of the fills of the features, but also to the very shallow depth of some of the cuts at critical points. However, it is possible to ascertain the following sequence



Illus 140. Stake group 2, possibly indicating the location of a cooking structure

Roundhouse B cut Palisade 2, the inner of the palisade slots, at Slot E, with the implication that Roundhouse B was constructed after the inner palisade was ruinous, had decayed or been dismantled. Given the close correspondence of Palisades 1 and 2, noted above, it is therefore probable that Roundhouse B was constructed after the palisades had ceased to function as enclosure.

The relationship of the souterrain to the roundhouses was also difficult to establish on the basis of observable physical relationships. In plan, prior to excavation, the cut of Roundhouse B was not visible in the fill of the souterrain, and it was not encountered during excavation of the souterrain deposits in Slot B. Unfortunately, the cut of Roundhouse B was poorly preserved at the point where it crossed the souterrain, and on the S side of the souterrain appeared to peter out completely; on the N side the cut joined the souterrain but was only c 10 mm deep, and the coarse gravel subsoil made it very difficult to determine whether the souterrain was cut by the ring-groove. Radiocarbon dating has indicated that the souterrain belongs with the same phase of activity as Roundhouse B, however, so that it may be possible that the ring-groove of the building was indeed interrupted to accommodate the souterrain.

Radiocarbon dating

A total of 16 radiocarbon determinations were obtained for samples from various deposits across the site, representing varied structural and functional elements as interpreted in the field ([Table 13](#)). The broad chronological sequence identified during the fieldwork stages

was tested through the selection of contexts likely to provide approximate dates for each of the elements of the site. The principal tests as outlined in the post excavation research design were to establish the date of the cutting of the ditch, to determine the date of the ditch to the palisade slots, to establish the relationship between Roundhouse A and Roundhouse B and to determine the relationship between the roundhouses and the souterrain. The issues of site duration and the duration and nature of the hiatus between Phases 1 and 2 have been examined through Bayesian modelling and are discussed in Chapter 6.

The radiocarbon results indicate a remarkable span of activity on the site: one which was certainly not anticipated prior to obtaining the radiocarbon results. In all, perhaps a minimum of 600 and possibly as much as 800 years separate the earliest settlement activity from the latest, with a probable abandonment and return to the site after a hiatus of around 200 years in the second half of the 1st millennium BC.

Sequence

The earliest date obtained from the palisaded enclosure comes from pit (235), SUERC-40851 which calibrates in the last third of the 4th millennium BC. This anomalous date probably indicates the presence of Neolithic activity at the site far earlier than any of the other features identified. So far as can be ascertained on the basis of the interpretable features, this pit seems isolated and unrelated to any of the other features excavated. It is notable that, unlike the other excavated features this pit contained a large quantity of hazel nut shells and fragments of pottery.

Table 13. Cults Loch 5: radiocarbon dates

Lab ID	Sample ID	Context	Material type	Species	$\delta^{13}\text{C}$ (‰)	Radiocarbon age (BP)	Calibrated radiocarbon date (95% confidence)
Neolithic activity SUERC-40851	[236]	Fill of pit [235] within Roundhouse B	charcoal	<i>Alnus</i> sp.	-26.8	4515 $\pm$ 35	3370–3090 cal BC
Phase 1; enclosure SUERC-40843	[34]	Primary fill of ditch	charcoal	<i>Benula</i> sp.	-26.8	2485 $\pm$ 35	790–410 cal BC
SUERC-40853	[15]	Fill of Palisade 2	charcoal	<i>Corylus avellana</i>	-25.7	2480 $\pm$ 35	780–410 cal BC
SUERC-40852	[15]	Fill of Palisade 2	charcoal	<i>Betula</i> sp.	-25.6	2420 $\pm$ 35	760–400 cal BC
Phase 1; Roundhouse a SUERC-40841	[214]	Fill of pit [215]	charcoal	<i>Corylus avellana</i>	-25	2485 $\pm$ 35	790–410 cal BC
SUERC-40855	[163]	Fill of posthole [162] in Post Ring 2	charcoal	<i>Corylus avellana</i>	-27.3	2455 $\pm$ 35	770–400 cal BC
SUERC-40842	[125]	Fill of ring-groove [124]	charcoal	<i>Alnus glutinosa</i>	-27	2580 $\pm$ 35	810–600 cal BC
SUERC-40857	[136]	Fill of pit [135]	charcoal	<i>Corylus avellana</i>	-26.9	2495 $\pm$ 35	790–410 cal BC
Phase 2; Roundhouse b SUERC-40854	[150]	Fill of posthole [149] in Post ring 1	charcoal	<i>Corylus avellana</i>	-26.2	2065 $\pm$ 35	190 cal BC–cal AD 20
SUERC-40861	[175]	Fill of ring groove	charred nutshell	<i>Corylus avellana</i>	-23.6	2060 $\pm$ 35	180 cal BC–cal AD 30
SUERC-40837	[177]	Fill of posthole [176] in Post ring 1	charred nutshell	<i>Corylus avellana</i>	-24.8	2050 $\pm$ 35	180 cal BC–cal AD 50
SUERC-40856	[156]	Fill of Pit [155]	charcoal	<i>Corylus avellana</i>	-26.8	1980 $\pm$ 35	50 cal BC–cal AD 90
Phase 2; souterrain SUERC-40844	[56]	Primary lining	charcoal	<i>Benula</i> sp.	-24.6	2105 $\pm$ 35	350–40 cal BC
SUERC-40847	[56]	Primary lining	charcoal	<i>Benula</i> sp.	-25.1	2075 $\pm$ 35	200 cal BC–cal AD 10
SUERC-40845	[58]	Upper layer	charcoal	<i>Salix</i> sp.	-28.6	2065 $\pm$ 35	190 cal BC–cal AD 20
Stake group 2 SUERC-40846	[009]	Fill of stakehole [001]	charcoal	<i>Salix</i> sp.	-25.7	2135 $\pm$ 35	360–50 cal BC

The primary phase of enclosure of the site occurred at some point around the middle of the 1st millennium BC, with dates from the primary ditch fill and from Palisade 2 calibrating in the range 790–400 cal BC. As might have been expected from the layout of the enclosure and the positions of the roundhouses within the interior, Roundhouse A was the earlier building, with dates from the fill of the building's ring-groove, a posthole in Post ring 2 and a pit within the interior yielding the same calibrated ranges as those for the enclosure features. The probability is, therefore, that Roundhouse A can correctly be placed with the original enclosure works at the beginning of the chronological sequence for the site, and is probably the primary roundhouse on the site.

It is likely that the settlement was abandoned by around 400 BC, with little evidence for any activity on the site in the period 400 BC to around 180 cal BC. This interval was probably sufficient for the palisades to completely decay, so that when Roundhouse B was constructed the ring-groove slot for that structure truncated the palisade trench to the N. Roundhouse B was evidently constructed over the location of possible cooking pits relating to the earlier phase of activity, as the date for the fill of pit (135) places it in the 800–400 BC bracket. Roundhouse B yielded dates from the fill of the ring-groove and from Post ring 1 that calibrate in the region 190 cal BC to cal AD 90, suggesting that the second phase of occupation at the site

took place in the 2nd or 1st century BC. The date for a pit cut through the entrance structure of Roundhouse A (presumably after the structure was dilapidated or completely decayed), calibrating in the range 50 cal BC to cal AD 90 would support the suggestion that the second phase of activity took place towards the latter end of the date range, perhaps in the 1st century BC. It seems clear, since the footprints of Roundhouses A and B overlap, that the former was completely destroyed by the time of the second building's construction. The association of small pits with both structures, presumably outside the limits of the buildings themselves, accounts for the intermixing of dates from Phases 1 and 2 within the footprints of each roundhouse; these were indistinguishable from structural postholes during excavation.

The position of the souterrain in the chronological sequence is apparently clear, although this presents a somewhat unusual arrangement of structures on the site. Dates from the charcoal from the burnt timber lining of the souterrain indicate that construction took place in Phase 2, in the 2nd or 1st century BC and therefore in all probability contemporary with the use of Roundhouse B. As described above, truncation of the Roundhouse B ringgroove was so severe that the feature was only around a centimetre deep at the point where it would have crossed the souterrain; this ambiguity means that it is impossible to be certain of the physical relationship between the two structures. The close concurrence of the radiocarbon dates for the souterrain and Roundhouse B, however, would imply a strong probability of contemporary use. The implication of this interpretation is that the souterrain was accessed from within Roundhouse B (see discussion below).

The scatter of generic pits surrounding both roundhouses apparently relate to activity in both phases; Stake Group 2 can be assigned to the later phase, while the similar pit (135) surrounded by stakeholes near the E entrance of Roundhouse 1 pre-dates the building itself, relating to the first phase of activity in the period c 790–410 cal BC.

Material culture

The coarse stone

Dawn McLaren

Overview

Only three worked stones were recovered from the excavation of the

palisaded enclosure in 2011. All three comprise fragments of quernstones: an upper beehive rotary quernstone fragment (SF8), a small fragment of very friable lower rotary quern (SF12) and a heavily degraded, wedge-shaped fragment of a possible saddle/rotary quern (SF10) ([Illus 141](#)). Although the assemblage is limited in size and in the range of worked stone recovered, the discovery of a beehive quern is significant not only because of the presence on site of a potential matching lower stone but also because of the limited distribution of this type of quern in SW Scotland.

Discussion

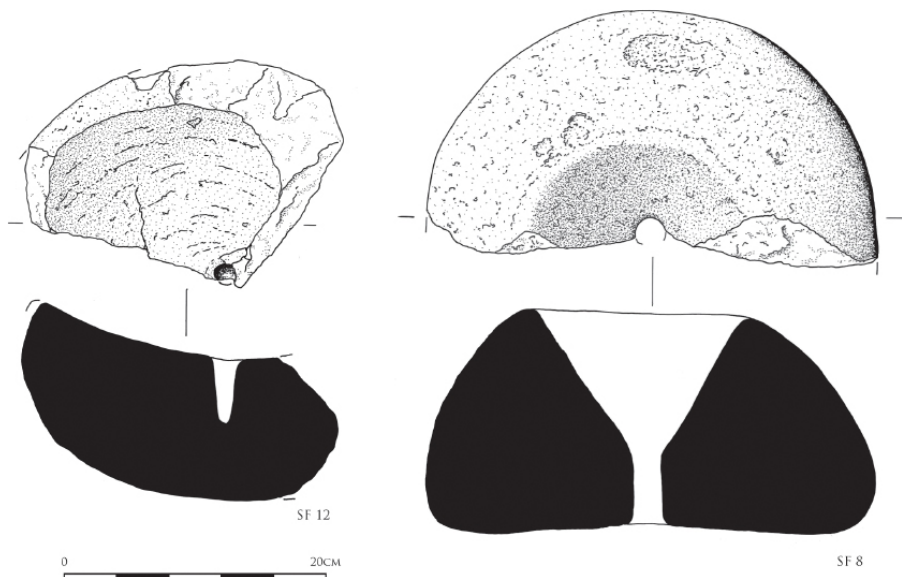
Beehive upper rotary quernstones are characterised by their narrow diameter and substantial thickness. They typically have steep rounded or sloped profiles (often greater than 40°; J Cruse pers comm) and many of the examples from Yorkshire and southern Britain have substantial raised collars encircling the conical or bowl-shaped hopper (Heslop 2008). Handle sockets tend to be horizontally sunk into the side of the querns and are usually placed at around mid-height or at least several centimetres above the grinding surface. This form of rotary stone is the predominant later prehistoric quern type in southern Britain with a more limited distribution in the north (Heslop 1988; 2008). Occurrences of beehive querns in southern Scotland are rare and the chronological and social implications of this restricted distribution are not well understood as the result of the lack of systematic study. This is in stark contrast to many parts of southern Britain where regional studies of querns of this type have provided valuable information on practices of manufacture, use and deposition (eg Heslop 2008; Peacock 2013; see [Chapter 7](#) for detailed discussion of regional comparanda).

FRAGMENTATION

The upper stone from Cults Loch 5 is fragmentary; only half of the circumference remains having broken across the central feeder pipe and deep conical hopper. No handle socket survives. Despite the friable condition of the granite in the acidic soils, the beehive quern's fragmentary state is unlikely to be the result of post-depositional degradation. An oval patch of deep peckmarks on the remaining rounded edge of the quern suggests deliberate damage. The lack of any trace of handle socket (a typical point of breakage through wear on less robust quern types) also argues against breakage during use although such a feature may have been lost post-deposition due to the

friable state of the stone. Heslop's detailed study of Yorkshire beehive querns concludes that it is almost impossible to break a quern of this form unintentionally due to the robustness of the design (2008, 68). In contrast to disc-and bun-shaped rotary querns, breakage due to wear is unlikely due to the thickness of the stone and the typically high placement of the horizontal handle which generally precludes the socket wearing through as the stone becomes thinner through extensive use. Despite the robustness of design and the low risk of breakage during use, most beehive querns recovered as the result of archaeological excavation are fragmentary, suggesting deliberate breakage and destruction prior to deposition. The frequent evidence for purposeful destruction strengthens the view that querns were considered as valued objects, requiring special treatment prior to deposition (ibid 70). Hingley argues that quernstones are just one type of object, connected to the agricultural cycle, which appear to have been deposited in significant contexts during the Scottish Iron Age (1992, 32).

Most frequently the querns are broken into fragments; an act which would have required a significant amount of force and determination to achieve. Others are defaced: the external surfaces are smashed off, the grinding face destroyed and raised collars can even be removed (eg Thorpe Thewles, Grindon, Stockton; Heslop 2008, 88, no. 1151, fig 33). A particularly clear example of defacement was noted on a beehive quern from Broxmouth, East Lothian where the stone had been split in two, the collar and much of the external surfaces removed (McLaren 2013, 317, 321, [Illus 10.32](#)).



Illus 141. Upper beehive rotary quernstone fragment (SF8) and lower rotary quern (SF12)

The lower rotary quern stone (SF12), is also in a fragmentary, highly friable state. Although the acidic soil is undoubtedly accountable for the stone's brittle condition, the recovery of only a quarter of the stone cannot also be attributed to unfavourable soil conditions. It is possible that it too, like the upper beehive quern, was deliberately fragmented prior to deposition.

he third worked stone recovered (SF10) is so badly degraded that it is not possible to clarify identification beyond that of being a possible saddle or rotary quern fragment.

CHRONOLOGY AND CONTEXT

The date of introduction of the beehive quern is problematic as querns are long-lived objects, often seeing re-use (Heslop 2008, 19). This problem is exacerbated in Scotland for two reasons: firstly, many querns are stray finds and lack contextual information to provide chronological resolution and secondly, rotary querns (particularly disc-querns) had a long currency of use in some parts of the country seeing use from later prehistory until the early 20th century (Fenton 1978, 388). The dating of contexts associated with beehive quern fragments in Yorkshire suggests that they were common on settlement sites in this area and further north by the 4th century BC if not earlier (Heslop 2008, 20). A 4th century BC date is also suggested by MacKie for the example from Lochfoot, Dumfries & Galloway (MacKie 1996), whereas the defaced beehive quern from Broxmouth, East Lothian came from a context broadly dated to the c 300 BC–AD 300 (Armit &

McKenzie 2013, 19). MacKie's 1971 study of rotary quern use in the Scottish Iron Age suggests that beehive and bun-shaped querns are more prevalent in the South and East whilst disc-querns are the more common type in the north and west (1971, 52–4, fig 5). By the Early Historic period, disc-querns are the predominant rotary quern type in use throughout Scotland and continued in use in some parts of the country until the early 20th century (MacKie 1971, 55).

The upper beehive quern (SF8) was recovered from backfill material within the souterrain (context 059) and the fragment of lower stone (SF12) came from a large oval pit (229) situated within the inner post-ring of Roundhouse B, directly opposite the south-west facing entrance. The significance of the context of the deposition of quernstones, particularly fragmentary examples, in association with later prehistoric domestic structures is still a matter of debate with some examples argued to be a case of expedient re-use of convenient stone for building or incidental discard (eg Dalladies – Watkins 1980a, 159), and others, such as house 4 at Broxmouth, East Lothian where the deposition of quern fragments appears to be more deliberate and meaningful (Büster & Armit 2013, 151). The contexts of recovery at Cults Loch 5 can be mirrored elsewhere hinting at a long tradition of similar depositional practices. Like the fragmentary lower stone (SF 12) which was recovered from a feature directly opposite the entrance of the roundhouse at Cults Loch 5, at the Early to Middle Bronze Age roundhouse at Lairg, a large inverted saddle quern was deposited at the rear of the building, directly opposite the entrance (McCullagh & Tipping 1998, 42–49). The deposition of quernstones within souterrains can be readily paralleled such as those discovered at Carlungie, Angus and Newmill, near Bankfoot, Perthshire (Wainwright 1963; Watkins 1980b, 180, 190, fig 11a *inter alia*).

Catalogue

SF 8 (Illus 141) Upper beehive rotary quernstone fragment. Approximately 50% of substantial friable rounded beehive granite quernstone, broken across central feeder pipe and large conical hopper. Interior of the hopper is smooth with occasional peckmarks remaining from manufacture (140 mm diameter at the rounded upper surface tapering to 22 mm where hopper joins the cylindrical feeder pipe). The barrel-shaped feeder pipe ranges in diameter from 17.5 mm to 25 mm. Dark staining towards the base of the socket is likely to be iron-pan staining. The rounded surfaces have been carefully shaped with occasional peckmarks remaining from manufacture. An oval concentration of deep peckmarks (70 mm × 94 mm) are present at

mid-height at the centre of the remaining rounded edge. This may represent a deliberate attempt to deface or further break the stone or an abandoned intent to produce a handle socket. The grinding face (radius 140 mm) is slightly rounded with bevelled, rounded edges suggesting that the stone was used in conjunction with a lower stone with a concave, dished grinding surface. No handle socket survives. Diameter approximately 347 T 183 mm. (059) possible backfill of souterrain.

SF 10 Possible quern fragment. Thick wedge-shaped degraded ? granite slab with one flat and one slightly rounded face. The surfaces are very friable causing the loss of all original faces. A curving, rounded original edge survives but is heavily degraded. No further original features survive to confirm identification as a quern fragment. L 173 W 150 T 55–67 mm. (70), fill of posthole (069) within interior of Roundhouse A.

SF 12 (*Illus 141*) Lower rotary quern fragment. Two joining fragments of a heavily degraded ?granite quernstone representing approximately 25% of the circumference, broken across the central cylindrical socket (D 11–16.5 mm; depth 45 mm). The stone is friable resulting in the loss of all original edges and much of the basal surface. Fine hairline cracks transect the grinding face but stone lacks discolouration consistent with firecracking. The original edge of the grinding surface has been lost but the face is dished from abrasion with regular pitting and shallow concentric scores (surviving radius 153 mm). Hints of a slight lip at the circumference of the grinding face suggest use with an upper stone of narrower diameter. Minimum original diameter 356 mm, remaining T 119 mm. (230), fill of Iron Age pit (229) within interior of Roundhouse B.

Ceramic and vitrified material

Dawn McLaren

The pottery

A small assemblage of pottery was recovered comprising ten sherds and multiple crumbs, with a combined total weight of 96.5 g, associated with both roundhouses and the souterrain. Four distinct fabric types have been identified (fabrics 1–4) suggesting that at least four separate vessels are represented by the small number of surviving sherds. None of the vessels are complete.

Fabrics were recorded by eye. In each case the fabric consists of fine silty clay with varying quantities of inclusions and/or voids which

were also recorded.

The majority of pieces consist of undecorated, undiagnostic body sherds representing coarse, thickwalled, handmade vessels. Only one diagnostic base sherd was present (SF 13) which appears to derive from a finer vessel.

The distribution of sherds concurs well with the distinction in pottery types (Table 14): fabric 1 is found exclusively with feature (050), fabric 2 with Roundhouse B and fabric 3 and 4 with Roundhouse A. A small spall from a body sherd (s 59b) which comes from the souterrain is more difficult to categorise due to the limited surviving surfaces but is most closely comparable to fabric 3.

CATALOGUE

The pottery was recorded by context with sherds being grouped by feature/structure.

Table 14. Cults Loch 5; the ceramic assemblage (no. sherds)

Structure	Fabric Feature	1	2	3	4
Roundhouse A	Posthole [160]	–	–	1	–
	Posthole [215]	–	–	–	1
	Pit [076]	–	–	1	–
	Gully [124]	–	–	1	–
Roundhouse B	Pit [235]	–	5	–	–
Gully [050]		4	–	–	–
Souterrain	backfill (059)	–	–	1	–

ROUNDHOUSE A

SF 15 Thick body sherd; red–brown silty clay fabric with defuse brown core and frequent large angular stone inclusions (average 4 mm D). Interior surface is stained dark brown from use. Fabric 3. L 52 W 34 T 13 mm. Mass 23 g. (161), fill of posthole (160).

S 77 Thick body sherd; silty clay, red–brown to buff in colour with slightly darker core and frequent angular unsorted stone inclusions. Fabric 3. L 24.5 W 26.5 T 15.5 mm. Mass 9.7 g. (077), fill of small pit (076).

S 125b Thick body sherd; silty clay, red–brown to buff in colour with defuse brown core and frequent angular stone inclusions. Fabric

3. L 33 W 25 T 12.5 mm. Mass 9.4 g. (125), fill of ring-groove (124).

S 214 Body sherd, heavily fired; fabric is light grey-buff silty clay with occasional angular stone inclusions and frequent sub-oval voids. Interior surface has wipemarks and is stained from use. Fabric 4. L 48.5 W 41.5 T 12.5 mm. Mass 15.2 g. (214), fill of posthole (215) within Roundhouse A.

LINEAR FEATURE TO THE EAST OF ROUNDHOUSE A (050)

SF 1 Four small friable body sherds and multiple crumbs. Fine silty clay fabric fired brown with red-brown to buff surfaces; frequent angular and rounded stone inclusions. Fabric 1. Largest sherd: L 20 W 20 T 10.5 mm. Mass 22 g. (051), fill of linear feature (050).

ROUNDHOUSE B

SF 13 Five sherds of coarse pottery including base sherd with rounded edges (L 40 W 25 T 12 mm). Fine silty clay fabric with red-brown exterior surface and dark brown core, interior margins and surfaces; frequent stone inclusions including occasional mica flecks. Interior surfaces are stained dark brown from use. Fabric 2. Mass 15.9 g. (236), fill of pit (235).

SOUTERRAIN

S 59b Small spall from body of coarse fabric vessel; red-orange silty clay fabric with slightly darker core and frequent angular stone inclusions. Fabric 3. L 13.5 W 14.5 T 17.5 mm. Mass 1.3 g. (059), orange brown silty sand, possible backfill of souterrain.

The fired clay

One large irregular piece of fired clay was recovered from the fill of Palisade 2. No evidence of modification to the shape was identified nor were any finger or wattle impressions noted. A further three small crumbs of lightly abraded silty red-brown fired clay came from posthole (149) associated with Roundhouse B.

S 17f Large thick irregular unabraded piece of red-orange fired clay; no shaping or impressions. Occasional unsorted stone inclusions. L 113.5 W 67.5 T 33.5 mm. Mass 167.5 g. (017), mid red-brown fill of Palisade 2.

S 150 Three small crumbs of silt red-brown fired ceramic; no original exterior surfaces remaining. Mass 0.6 g. (150), fill of posthole (149) associated with Roundhouse B.

The vitrified material

Over 90g of vitrified material was recovered from burnt deposits within the souterrain, (057) and (058). The material consists of amorphous fractured fragments and globular nodules of low-density, silica-rich, non-magnetic fuel ash slag. No metalworking residues were present.

Fuel ash slag forms when material such as sand, earth, clay, stones or ceramics are subjected to high temperatures, for example in a hearth. During heating these materials react, melt or fuse with ash from the fire, producing glassy, vitrified and porous materials. These slags can be formed during any high temperature pyrotechnic process and are not necessarily indicative of deliberate industrial activity (McDonnell 1994, 230).

The association of this material with burnt deposits within the souterrain suggests that the fuel ash slag is contemporary with, and a product of, the burning event that took place after the backfilling of the structure.

S 57 Multiple amorphous nodules of low-density, silica-rich fuel ash slag. The material is brittle, porous and non-magnetic. Mass 90.3 g. (057), burnt sand forming a step into the souterrain.

S 58b Multiple small ovoid nodules and globular spalls of low density, brittle, porous silica-rich fuel ash slag; not magnetic. Ranges in colour from light brown, dark brown to blue grey/green. Mass 2.7 g. (058), layers of burning within souterrain, post-dating backfilling of structure.

Environmental remains

Jackaline Robertson

Introduction

A small assemblage of charred macroplant, carbonised wood and burnt bone was recovered from the excavation. All three assemblages were small and it was only by drawing all the environmental evidence together was it possible to address the specific questions raised during the excavation. The issues under consideration concern the relationship between features and phases, the type of materials used in construction, how natural resources were exploited and whether this changed over time.

The charred macroplant assemblage was small and poorly preserved. The plant remains were comprised mostly of barley

(*Hordeum* sp), bread/club wheat (*Triticum aestivum*-type), spelt (cf *Triticum spelta* L), wheat (*Triticum* sp), oat (*Sativa* sp), hazelnut shell (*Corylus avellana* L) along with a small number of weed taxa from waste ground and wet/damp habitats.

The charcoal species were oak (*Quercus* sp.), hazel (*Corylus avellana*), alder (*Alnus glutinosa*), birch (*Betula* sp.) and willow (*Salix* sp.). The charcoal assemblage contained small fragments of twigs and roundwood but no worked wood offcuts.

The bone assemblage was collected both by hand and from the bulk samples and numbered 1438 fragments of which 99% were burnt. The preservation of the bone was poor and only 44 fragments could be identified to element and or species. The remainder were categorised as either large mammal or unidentifiable. The species identified were cattle, sheep/goat and pig. The cattle teeth fragments present in (205) were clearly modern and are not discussed further.

Results summarised by phase, feature and material type

The data is tabulated in [Appendix 6](#). The quantities of charcoal and bone in each context are expressed below as proportions of the total site assemblage.

Phase 1

DITCH 1

Macroplant: Two contexts, (034) and (037), produced a small quantity of poorly preserved hazelnut shell and weed taxa.

Charcoal: The charcoal assemblage from five slots in Ditch 1 consisted of small fragments of oak, hazel alder and birch which accounted for 3.6%.

Burnt bone: The bone fragments identified from three slots in Ditch 1 accounted for 0.3% of the entire assemblage recovered from the site.

Synthesis: The ditch fills contained remarkably low levels of environmental material, possibly because of distance from domestic activity.

PALISADES 1 & 2

Macroplant: A single context from the double palisade produced a small quantity of charred macroplant remains but these were so poorly preserved that only barley caryopses could be identified with any confidence.

Charcoal: The charcoal from nine slots in the palisade accounted for

7% and consisted of small fragments of oak, hazel with a few pieces of alder and birch. There were never more than two species present in any one slot nor were there any roundwood and twig fragments. The charcoal was spread throughout the slots in both Palisades 1 and 2 with no obvious evidence of differentiation between the two.

Burnt bone: The bone fragments recorded from five slots in the palisade comprised 4%. All of these fragments were smaller than 10 mm and none were diagnostic.

Synthesis: The plant remains, charcoal and burnt bone do not represent *in situ* deposition and are more likely the result of background material incorporated accidentally into this feature during backfilling. There was no evidence of *in situ* structural burning or fuel debris.

ROUNDHOUSE A; POST RINGS 2 AND 3

Macroplant: Barley, bread/club wheat, wheat, a single cereal chaff fragment and hazelnut shell were recovered from six samples in Post ring 2 and four from Post ring 3. The weed species were common waste ground taxa along with a larger quantity of sedge.

Charcoal: Oak, hazel, alder and birch were identified in Post ring 2 which comprised 17% and Post ring 3 which accounted for 11%. These included roundwood fragments smaller than 10 mm in diameter. Two or more species were present in every feature.

Burnt bone: One of the largest concentrations of burnt bone was recovered from this structure, with 34% in Post ring 2 and 15% in Post ring 3. None of these fragments exceed 20 mm and most were smaller than 10 mm. A single bone was tentatively identified as a third phalange although species could not be confirmed. The bone fragments recovered from these two post rings had also suffered different degrees of burning at varying temperatures as several had prominent black, grey and blue patches on their external surface.

Synthesis: The mix of environmental material is suggestive of domestic waste refuse originating from hearth deposits. Given the presence of food waste it seems most likely that the charcoal remains also represent fuel debris rather than structural burning.

ROUNDHOUSE A; OTHER FEATURES

Macroplant: Pit (213) and two slots in the ring-groove produced a small quantity of cereal caryopses some of which were loosely identified as spelt. Fragments of hazelnut shell were also recovered.

Charcoal: The charcoal recovered from pit (213) was exclusively oak

and accounted for 6.2%. No roundwood or twigs were recovered, but some of the fragments were larger than 5 mm. The charcoal recovered from the fill of the ring-groove (125) in slots A and C contained a mixture of oak, hazel, alder and birch which comprised 3.9%.

Burnt bone: The other large concentration of burnt bone came from pit (213) which accounted for 21.2%. A skull fragment, long bone fragments and a pig canine were all recorded in this pit. The majority of the fragments in this pit were larger than 10 mm, the largest being 90 mm. These remains had been exposed to varying temperatures and burning times. The bone from three slots in the ringgroove amounted to 1.1% of the total assemblage. The bone fragments in the ring-groove were mostly smaller than 10 mm, and had also been exposed to different temperatures.

Synthesis: The macroplant remains and, in particular the quantity of bone recovered from pit (213) suggests that this deposit represents domestic waste associated with cooking and food preparation. Although the charcoal from the pit is dominated by oak, the interpretation of pit (213) as a cooking hearth (see above) seems consistent with the character of the environmental assemblage.

Phase 2

ROUNDHOUSE B; POST RING 1

Macroplant: The material recovered from two postholes in Post ring 1 consisted of a small number of poorly preserved cereals, hazelnut shell and sedge.

Charcoal: Small fragments of hazel and alder were collected from three postholes in Post ring 1 which accounted for 0.6% of the total assemblage. No roundwood or twig fragments were recovered.

Burnt bone: The bone fragments retrieved from four postholes in Post ring 1 accounted for 1.8% of the total assemblage. All of the fragments were completely calcified and most were smaller than 10 mm.

Synthesis: The environmental remains were spread throughout Post ring 1 with no obvious evidence of deliberate disposal or dumping; the only deposit in which all three material types occurred together was (150), the fill of posthole (149). These remains probably represent re-deposited background material which has become incorporated within this feature during backfilling.

ROUNDHOUSE B; OTHER FEATURES

Macroplant: Three pits and two slots from the ring-groove in

Roundhouse B produced a small quantity of oat, cereal caryopses and hazelnut shell, as well as a small amount of thistle and sedge. Oat and weed taxa were recovered from pits (135) and (229).

Charcoal: Pit (135) contained small fragments of hazel and willow roundwood comprising 1.4%. Roundwood fragments of oak, hazel, alder, birch and a single fragment of willow were collected from five slots in the ring-groove and accounted for 2%.

Burnt bone: The burnt bone fragments recovered from two pits and a single feature from the ring-groove amounted to 5.2%. A fragment of long bone was identified in pit (135) along with a piece of scapula from the ringgroove. The largest long bone fragment was 40 mm although most were smaller than 10 mm. The bone had been burnt at different temperatures for varying times.

Synthesis: The environmental material recovered from Roundhouse B probably represents fuel, cooking and cleaning debris. The only other structure from which oats were recovered was the souterrain, which was probably in use at the same time as Roundhouse B, so oats may have been introduced to the area in the period between Phases 1 and 2. The charcoal assemblage from the ring-grooves could represent a mixture of fuel debris and structural debris; the presence of small roundwood fragments is suggestive of wattle screen walling but the evidence is not conclusive.

Pit (235) was located within Roundhouse A but produced a Neolithic date. It contained a mixed assemblage of alder, oak and hazel charcoal which made up 4%, and a single fragment of bone. It also contained in excess of 100 fragments of hazelnut shell, a greater concentration than in any other context on the site, which suggests deliberate deposition, rather than chance incorporation.

SOUTERRAIN

Macroplant: The charred macroplant assemblage from the souterrain was small but contained a mix of cereal and weed taxa spread throughout eight contexts and slots. The plant remains were barley, wheat, oat, cereal, hazel, grass, sedge and weed taxa. The grass and sedge were concentrated in deposit (057).

Charcoal: The charcoal from the souterrain accounted for 24.3%. The dominant species present was oak, which was better preserved in this feature than in any other on site. Contexts (058) and (059) contained large oak fragments whereas the charcoal in deposits (055), (056) and (057) was more mixed, and included hazel, alder, birch, oak and willow, some of which was small roundwood and twig fragments.

Burnt bone: Burnt bone was recovered from seven contexts in the souterrain, representing 10%. The bone was concentrated in Slot B, context (058), with only a few fragments recovered from the remaining six deposits.

Synthesis: The sedge nutlets and grass in deposit (057) may represent flooring material (see [Chapter 2e](#)) into which fuel debris, represented by the mixed charcoal fragments, was trampled. Deposit (058) is interpreted as a layer of burning, post-dating the use of the souterrain and possibly deriving from the destruction of the superstructures of [Phase 2](#) activity. The food waste in this deposit may have become incorporated during the conflagration event. A small quantity of oats was recovered from the deposits in the souterrain. As discussed above, the only other feature on the site from which oats were recovered was Roundhouse B.

The charcoal has proved useful in detecting spatial differences within the souterrain. Contexts (058) and (059) contained oak fragments which were generally larger than those found in the other slots in the souterrain, and it seems likely that this derives from the *in situ* burning of the lining or superstructure of the souterrain. The charcoal assemblages from deposits (055), (056) and (057) are more mixed, however, and include small roundwood and twig fragments. The varied character of this charcoal may indicate the intermixing of fuel debris with the backfill of the souterrain, though the incorporation of material used as roofing for the structure should not be discounted.

STAKE GROUP 2

Macroplant: A small quantity of poorly preserved hazelnut shell was recovered from three contexts.

Charcoal: Charcoal forming 19% of the total assemblage was recovered from six contexts. The species present were oak, hazel, willow, alder and birch, some of which was roundwood.

Burnt bone: The six contexts from this area accounted for 10% of the burnt bone fragments most of which were smaller than 10 mm in size. The bone was spread throughout these features with no obvious concentration of finds in any particular context. None could be identified to species or element.

Synthesis: The contexts from this series of features contained two or more species which suggests that these remains represent fuel debris rather than structural burning. The environmental assemblage from Stake Group 2 was limited, but the mixed character of the charcoal and relatively abundant burnt bone would not conflict with the

interpretation of this feature as a cooking area.

Discussion

The plant remains

The plant remains identified as cultivated foodstuffs were charred cereal remains comprised of barley, bread/club wheat, spelt, and oat. These were concentrated in the souterrain, post ring 2, post ring 3, Roundhouse A and Roundhouse B in those deposits described as pits, associated with fuel debris or as the result of backfilling. Two fragments of chaff were recovered post ring 2 and the souterrain. The absence of any oat florets made it impossible to establish if these were the cultivated or wild variety. There is no evidence of cereal processing or dumping of processing waste in the environmental remains on any part of the site, suggesting that cereal was transported to this area after being processed. The presence of a free threshing bread/club wheat caryopsis is of interest as this is a rare find in pre-Roman Iron Age Scotland.

The inhabitants of the site also exploited wild resources such as hazelnuts for food and sedge, possibly for fuel and building materials. Hazelnut shells are among the most common finds from Iron Age sites due in part to their easy availability, their high nutritional content and the ability of the shell to survive within the archaeological record even in the poorest environmental conditions (Johnston *et al* 2007). The greatest concentration of hazelnut shell was recovered from a Neolithic pit (236) located within the footprint of Roundhouse B. The hazelnut shell which derives from the Iron Age phases of occupation was much smaller and scattered throughout the site. Sedge has traditionally been used to line floor surfaces, especially when bracken was unavailable or difficult to source during the winter (Johnston *et al* 2007). Sedge was typically recovered from those contexts which also contained fuel debris but it may also have been used as roofing.

The weed assemblages were small in both quantity and diversity and are commonly found on agricultural land, waste ground and damp habitats. Weed taxa were recovered from every deposit and were spread throughout the site with no obvious concentrations suggestive of deliberate disposal.

Charcoal

The nature of the charcoal assemblage from the ringgrooves made it impossible to determine whether wattle or plank construction was

used. Roundhouse B contained fewer fragments of charcoal but a greater variety of species. These included small roundwood fragments possibly too small for use as wattle and are more likely representative of fuel debris rather than structural burning. The remains from Roundhouse A are more plausibly interpreted as the in-situ burning of a discrete oak structure along with fuel debris in the ring-grooves.

Evidence of structural burning was present in two slots in the souterrain, with the remainder of the assemblage from the other slots more reminiscent of fuel debris, presumably having been incorporated into the feature during backfilling. These two slots indicate that this section of the souterrain's superstructure and lining was constructed from oak.

Overall the charcoal assemblage was predominantly representative of fuel debris originating from domestic activities as confirmed by the presence of cooking and cleaning waste in the form of food remains. There is some evidence of in situ deposition, but for many of the features the presence of the charcoal appears to be the result of residual material being unintentionally incorporated into features.

Bone

The bone assemblage was small but there was a clear concentration of material in [Phase 1](#) in post ring 2, post ring 3 and other features within Roundhouse A. Those features in [Phase 2](#) which contained only a few small fragments can generally be discounted as residual material being accidentally incorporated into features during backfilling. The charred condition of the bone varied and while most were completely calcified some were only partially charred black, grey, blue and white. This indicates that these remains have been exposed to different temperatures for varying durations, strongly supporting the view that this material has originated from cooking and food preparation waste.

Conclusion

The environmental material recovered from Cults Loch 5 was concentrated in [Phase 1](#). On initial analyses the macroplant remains appeared to be concentrated in Roundhouse B, dated to [Phase 2](#), but this figure was artificially inflated by the recovery of over 100 hazelnut shells shown by radiocarbon dating to have been deposited in the Neolithic period.

The bone and charcoal do not reveal any differences or changes in what resources were available or being exploited. The macroplant assemblage presents a different result, in [Phase 1](#) barley and wheat

were present whereas during [Phase 2](#) the cereals identified were oat and wheat. The small size and poor condition of the assemblage hampers any conclusive argument that cereal exploitation had altered over time. As the cultivated variety of oat could not be conclusively identified, the remains from this site could be the wild species and represent agricultural contaminants rather than deliberately harvested food stuffs. On the available evidence it is not possible to state with any confidence that agricultural practices and cereal consumption altered during the different phases of occupation. What can be stated with some certainty is that wheat was an important cereal during both [Phases 1](#) and [2](#).

The site at Cults Loch 5 is a domestic setting which has experienced periods of abandonment but its landscape and the type of economy practised has never altered significantly. The inhabitants of this site had access to a range of resources from varying habitats. It is evident that resources such as sheep/goat and pig, cereals and hazelnuts formed part of their diet and that wood including oak, hazel, birch, alder and willow were used in construction and fuel.

Cults Loch 5: discussion

The enclosure

The Cults Loch palisaded enclosure is in many respects typical of such sites in southern Scotland, and conforms to a well known pattern of double-palisaded, ditch-and-bank enclosures. Palisaded enclosures in all their various forms are widespread across southern Scotland and northern England, since their first identification as a major feature of the settlement record through aerial survey and research programmes focussed on the uplands of Northumbria and the Borders (eg Ritchie 1970; Jobey 1959; Cowley & Brophy 2001). Subsequent decades of excavation and survey have served only to demonstrate that palisades as a form of enclosure have an extremely long chronological currency, and cannot be taken as indicative of any particular function or date. Even morphology is unreliable: a palisaded enclosure in Ayrshire that would in most instances have been taken as later prehistoric on the basis of aerial survey was shown to date from the 8th to 10th centuries AD (Johnson *et al* 2003). Recent publications have reviewed the current state of our understanding of palisaded enclosures in southern Scotland (eg Cavers *et al* 2012; Ellis 2007; Atkinson 2000; RCAHMS 1997); the reader is referred to those publications for assessment of research since Ritchie's review in 1970.

Of course, palisaded enclosure in and of itself cannot be taken as

diagnostic of any particular chronological or cultural significance, and the decades of field investigation since the dismissal of the 'Hownam sequence' as a reliable framework for the chronological pigeon-holing of Iron Age defences (Harding 1982; Armit 1999) has clearly demonstrated the variability within the class. In essence, palisades simply comprise a means of defining an enclosure for any purpose, and, as is now abundantly clear from the numerous excavated examples, were employed throughout much of prehistory and history as a means of defining enclosures for a wide variety of purposes. Even where palisaded enclosures are identified securely within well-dated sequences, their form varies considerably within chronological boundaries, and constructional techniques were equally varied.

More fruitful analysis might be obtained by distinguishing those palisade slots which formed the framework of an enclosing rampart associated with a ditch from more simple examples. Double palisades of the type found at Cults Loch are typical of the early phases of multivallate enclosures where such sequences have been documented, and slots very similar in character were excavated at Hownam Rings (Piggott 1949, 200) and Hayhope Knowe (Piggott 1951, 54) and have been identified in the early phases of a number of southern palisade/fortification sequences, as at Gibbs Hill (RCAHMS 1997, 123). The interpretation of double palisades has varied widely, from the earthfast component of a box-style rampart (description by Ralston 2006, 47) to lean-to structures built up against the interior face of an enclosing earthwork (eg Nisbet 1996, 57). The different depths of Palisades 1 and 2 at Cults Loch might suggest that the two structures performed slightly different functions, but the close correspondence of their circuit must surely imply that they were constructed together. The close spacing of the slots might indicate that they belong alongside the early-phase box-rampart type of palisade investigated by Piggott at Hayhope Knowe and Hownam Rings, while similar double slots were excavated in early phases of enclosure at the Leven (Atkinson 2000) and Craigmarloch in Renfrewshire (Nesbit 1996). The empty space between the outer ditch and the palisade slots at Cults Loch, however, which was virtually devoid of cut features, might indicate that the upcast of the ditch was located here, perhaps ramped up to the wooden palisade. In such an arrangement, the structure represented by the double palisade slot may have been part of this defensive ring work, rather than an early phase, simple enclosure.

The sequence of occupation at Cults Loch is typical of defended enclosures in southern Scotland, whereby the original layout is complicated by later reoccupation that appears to have taken place

after the dilapidation of the enclosure works. Although the southern portion of the enclosure was not investigated at Cults Loch, the concentricity of the outwork to Roundhouse A implies that this was the original structure, with Roundhouse B built some time afterwards. The construction of Roundhouse B, therefore, presumably indicates a re-occupation of a dilapidated site that was still visible as an upstanding enclosure within the landscape: this scenario finds close parallels in the identifiable occupation and construction sequences of many southern Scottish enclosed settlements, and must surely demonstrate the significance of the location over the functional importance of the enclosure.

The roundhouses

Ring-groove houses as a class are not chronologically diagnostic, and examples very similar in character to the Cults Loch buildings have been found to date from the mid-2nd millennium BC (eg the mid-late Bronze Age platform houses at Green Knowe (Jobey 1980) and a series of ring-groove structures at Lambs Nursery (Cook 2000)) and throughout the 1st millennium BC. The roundhouses within the palisaded enclosure at Cults Loch are of a type which is increasingly considered typical of the southwest, and to some extent comprise a chronological sub-group of the ring-grooved building in southern Scotland more widely. Double-entranced ring-grooves were found at Rispaan Camp (Haggarty & Haggarty 1982) as well as at Hayknowes (Gregory 2001), and Carronbridge (Johnston 1994), while the double entrances at Ardwell broch on the west coast of the Rhins has been interpreted as a translation into stone of the same local style (Cavers 2008, 16). Buildings of this type were not exclusive to the south west, however, with very similar structures excavated at St Germain's (Alexander & Watkins 1998, 213–214) and Broxmouth (Hill 1982; Armit and McKenzie 2013), while numerous probable examples can be identified within the cropmark record. The dates obtained for these excavated examples consistently give the impression that this style of building was typical of the period roughly spanning the 2nd century BC to 2nd century AD, with Rispaan, Carronbridge and Hayknowes all indicating use in the early centuries AD, and the frequency with which they appear to be associated with rectilinear enclosures would align with the currently understood chronology of those sites. The Roman and Romano-British finds from St Germain's were unstratified, and the dating of the relative phases of that site is not secure, but the impression is similarly that the ring-groove house at that site probably belongs in the early 1st millennium AD. Roundhouse B at Cults Loch,

therefore, represents a rather early example of the double-entranced type, with the probability being that the structure was built in the 2nd or 1st century BC; there was nothing to indicate that occupation of the site continued much beyond the turn of the millennium. It is unfortunate that the full extent of Roundhouse A was not within the area for which excavation consent was obtained, since the dates for that structure are considerably earlier: the very similar diameter of the building and the same post-ring and groove construction would imply that the structures were designed to a similar template, but whether Roundhouse A had a second entrance is unknown. The similarities between the Cults Loch roundhouses and those mentioned above are nonetheless striking. The Rispaan Camp roundhouse is particularly similar, having an almost identical diameter and spacing of internal posts inside the ring-groove of Roundhouse B.

Although the full extent of the building cannot reliably be equated with the ring-groove (see discussion by Harding 2010), and external stakes were recorded surrounding the ring-groove of Building 1 at Carronbridge (Johnston 1994, 245), the lack of features surrounding the ring-groove at Cults Loch would imply that the main living space was contained within space defined by the walling held by that slot. The relatively poor preservation of the ring-groove slot for much of its circuit in both buildings precludes any clear interpretation of the nature of the walling itself, but as noted above the Roundhouse A slot appeared to have been dug in a series of sections, perhaps suggesting that the walls comprised wattle hurdles, constructed in segments and bedded within the ring-groove. Fragments of dried clay recovered from Roundhouse B may indicate that these walls were daubed. Typically, the Cults Loch ring-grooves terminated in heavy posts, presumably accommodating the door frame; the additional posts outside the entrance are likely to indicate the presence of porch features at each entrance; such features are a common addition to ringgroove houses excavated across Scotland, being found on examples from both earlier (eg Dunwell 2007, 46–47) and later (eg Gregory 2001) horizons.

The presence of curvilinear features within Roundhouse A at Cults Loch is intriguing, since similar subdivisions within ring-grooved houses have been recorded within the examples at Rispaan and Carronbridge. The occurrence of these features at comparable sites suggests that they are genuinely related to the internal furnishings of the house, and not to some prior or subsequent phase of activity. At Cults Loch, as at Rispaan and Carronbridge, the curvilinear features within Roundhouse A define small partitions within the structure, and

are not concentric with the outer wall. It is difficult to speculate on how these divisions would have functioned, although lightweight screens separating internal activity areas would be a reasonable interpretation. A similar 'screen'-like arrangement near the entrance may have been present in the roundhouse excavated at Soleburn, Leswalt (Bain & Cullen 1996).

The souterrain

The souterrain is the first such feature to be excavated in Dumfries & Galloway, and adds excavated information to a newly-recognised distribution of souterrains in southern Scotland. At the time of Welfare's assessment of the southern Scottish souterrain distribution, none had been recognised in Dumfries & Galloway, with the scattered examples of the Lothians and Borders seen as southern outliers of an ostensibly eastern distribution (Welfare 1984, 305; Childe 1933, 377–382). Wainwright's (1963) collation of the evidence for souterrains under the 'Southern Pictland' banner, combined with the bulk of evidence which had historically derived from excavation and aerial survey in Angus and Aberdeenshire, had led to the treatment of souterrains in Scotland as characteristic of the northeastern Iron Age, even examples in Orkney and Shetland being seen as distinct from the main group (Wainwright 1963, 13). The impact of recent reassessments, however, which have taken a less prescriptive view on the class and considered both the range of related structures found throughout Atlantic Scotland and the rapidly growing dataset of examples from southern Scotland beyond the south-east, has been to create the impression that souterrains are far more widely distributed in Scotland than had previously been accepted, although the Angus/Aberdeenshire group retains its identity as a particular concentration in contrast to those areas south of the Forth (see summary by Armit 1999, 578).

The concentration of souterrains detected in eastern Scotland is certainly biased by the suitability of the area for the detection of such features in well-drained agricultural land, and the increase in systematic survey over productive areas of SW Scotland has brought about a concomitant increase in the number of souterrains detected there (see Maxwell 1987; Cowley & Brophy 2001), so that the scattered examples located on the typically productive agricultural soils around Luce Bay and the Rhinns should be seen as the visible component of a much wider distribution. Where souterrains have been identified in SW Scotland, they appear mainly to be of timber construction, visible as signature curvilinear patches associated with

roundhouses and palisaded enclosures. Prior to the Cults Loch excavation, however, there had been little evidence upon which to base any assessment of the chronological or cultural context for these sites: they could perhaps equally be considered alongside the extensive distribution of souterrains in northern Ireland which are apparently, for the most part, of Early Historic date (Thomas 1972; Warner 1979), although the starkly complementary distribution either side of the Irish Sea might prompt a reassessment of the anticipated date of both groups. Leaving the relationship with Ireland to one side for the moment, however, the Wigtownshire souterrains identified by aerial photography are nonetheless sufficiently similar to those of the 'Southern Pictland' group to present the hypothesis that they belong within the same chronological context, and the features of the Cults Loch souterrain indeed show some remarkable similarities with the wider patterns apparent in previously excavated examples.

While the original type sites at Ardestie and Carlungie described by Wainwright (1963) comprised stone-built passages, research in recent decades led by both aerial survey and developer-funded excavation has shown that entirely timber-lined souterrains of the type excavated at Cults Loch were widespread, and perhaps even more numerous than those incorporating stone walls. Again, there is no apparent pattern in the choice of stone or timber lining, with recent examples of the stone walled variants (eg Mudie 2007; Miket 2002, 92) yielding dates spanning the last three centuries BC, while timber lined examples have been excavated in Angus (eg Redcastle, Alexander 2005; Dubton, Cameron 2002) and Morayshire (Grantown Road, Cook 2016) that demonstrate that the choice of structural materials is likely to have been a matter of local preference rather than of chronological significance.

The interpretation of souterrains has varied widely in scope and plausibility. Armit's collation of the data recovered from the 'Southern Pictland' group summarised the ongoing discussion of the function and social significance of souterrains with the advantage over Wainwright's original synthesis of the benefit of several modern excavations, and the recognition that souterrains were probably most frequently associated with roundhouses above ground, following Watkins' excavations at Dalladies and Newmill (Watkins 1980a; 1980b). As such, they are now accepted as common features of Iron Age settlements, with interpretations as sites with specific functions (eg byres, refuges or workshops) now finding less favour. On balance, the weight of evidence seems to support the view that souterrains were used for storage, perhaps of grain surpluses, although Armit is

surely correct to point out that sacred and profane were probably not divisible in any Iron Age structure (Armit 1999, 583), so that the ritualistic aspects of subterranean passages in the Iron Age, including souterrains, cannot be fully ruled out (cf. Watkins 1980b, 98; Miket 2002, 85). Preference for the grain storage interpretation was the basis for Watkins' suggestion that souterrains indicate the accrual of wealth in the form of stored produce beyond the immediate requirements of the occupants (Watkins 1980b, 199), a theme that was developed by Armit in advancing the hypothesis that the southern souterrains represent either socio-economic adjustment or 'opportunistic landtaking' by communities displaced from north of the Forth in the aftermath of the Roman presence (1999, 594).

Although for reasons outlined above the relationship was not clear cut, the balance of probability suggests that the Cults Loch souterrain was entered from within Roundhouse B. This arrangement must have required the articulation of the roundhouse outer wall, presumably (but not definitely) represented by the ring-groove, with the roofing of the souterrain itself. As discussed by Armit, it seems probable that the subsoil excavated during the construction of the Cults Loch souterrain was employed as a bank surrounding the passage (1999, 584), thereby accounting for the mixture of subsoil and organic soils found in the backfill of sites like Newmill, and the excavated evidence from Carghidown promontory fort, where a ring-groove house of similar (though not identical) character to that at Cults Loch suggested that the wall of the roundhouse may have been supported or bedded within a bank (Toolis 2007), traces of which would not have survived centuries of ploughing at Cults Loch. An upcast bank could well have supported the wooden superstructure of the souterrain, as suggested by Alexander (2005, 90) which, as at Redcastle, would account for the lack of any postholes for roof supports surrounding the souterrain. As noted by previous excavators, the superstructure may well have been partially supported or covered by turf, accounting for the increased occurrence of herbaceous pollen on sites like Redcastle (eg Church 2005, 74). There was no demonstrable stone element to the Cults Loch souterrain superstructure, but the large boulders found in the upper fill might have derived from a kerb surrounding this bank. The charcoal distribution throughout the souterrain fill suggests that the roof/superstructure may have been more substantial than the lining, probably employing oak posts or planks, while the lining may have been lightweight, perhaps employing wattle (suggested by roundwood fragments in the lining deposit) and daub.

The Cults Loch souterrain offers some interesting parallels for the

process of destruction or dismantling noted in many of the excavated souterrains in eastern Scotland. As discussed by Wainwright, several structures seem likely to have been deliberately destroyed, backfilled or dismantled (1963, 99), and this pattern seems recurrent in the excavated evidence recovered from other excavated sites, including Newmill, Dalladies, Glen Cloy (Mudie 2007), Redcastle (Alexander 2005, 92) and perhaps at Cyderhall (Pollock 1992, 153) and Grantown Road (Cook 2016). Arguably, it is debatable whether the fills of souterrains are as clearly indicative of purposeful backfilling as is often claimed in the absence of soil micromorphological analysis (it was not possible to take such samples from the loose, coarse gravel fill of the Cults Loch souterrain), and the excavator of the Shanzie souterrain felt that the fill of that site indicated the opposite (Coleman & Hunter 2002, 97), suggesting that some souterrain passages probably lay open and derelict in the years following their abandonment. These caveats accepted, there are reasons for seeing the Cults Loch evidence as supportive of deliberate backfilling of the souterrain. As noted above, the timber lining which survived at Cults Loch as a thin black charcoal layer, could not have formed *in situ* had the passageway been open, since it is difficult to envisage how this layer could have survived intact in an open conflagration; the reducing conditions created by the backfilling of the souterrain, furthermore, were presumably what would have allowed the formation of this lining deposit. In this light, the presence of broken rotary quern fragments in the base of the souterrain which are unlikely to have been casual losses (see discussion by McLaren, above) as well as the evidence for burning of the structure after its destruction accord well with evidence recovered from Newmill discussed by Armit (1999, 584). If the argument for the structured deposition of querns in souterrains is accepted – and the frequency with which they are recovered from souterrain fills is striking – then the evidence for a ritualised ‘closure’ of the Cults Loch souterrain, involving the deposition of significant objects, backfilling and burning, is compelling.

This evidence, however, sits somewhat awkwardly with the model for the souterrain ‘abandonment horizon’ postulated by Armit. While the Cults Loch evidence aligns well with the pattern identified in the east, the likelihood is that the ‘closure’ event occurred well before Armit’s postulated abandonment horizon, which he suggests was probably in the 2nd century AD (though see Coleman & Hunter 2002, 97 for a discussion of the chronological sensitivity of Roman finds from souterrains), with the dates for the Cults Loch souterrain lining

suggesting that site was in use in the last two centuries BC. The implication is that whatever the cultural significance of the ritualised closure of souterrains, it may have been as long-lived as the site type itself; and need not be considered specific to the later abandonment horizon of the Southern Pictland group.

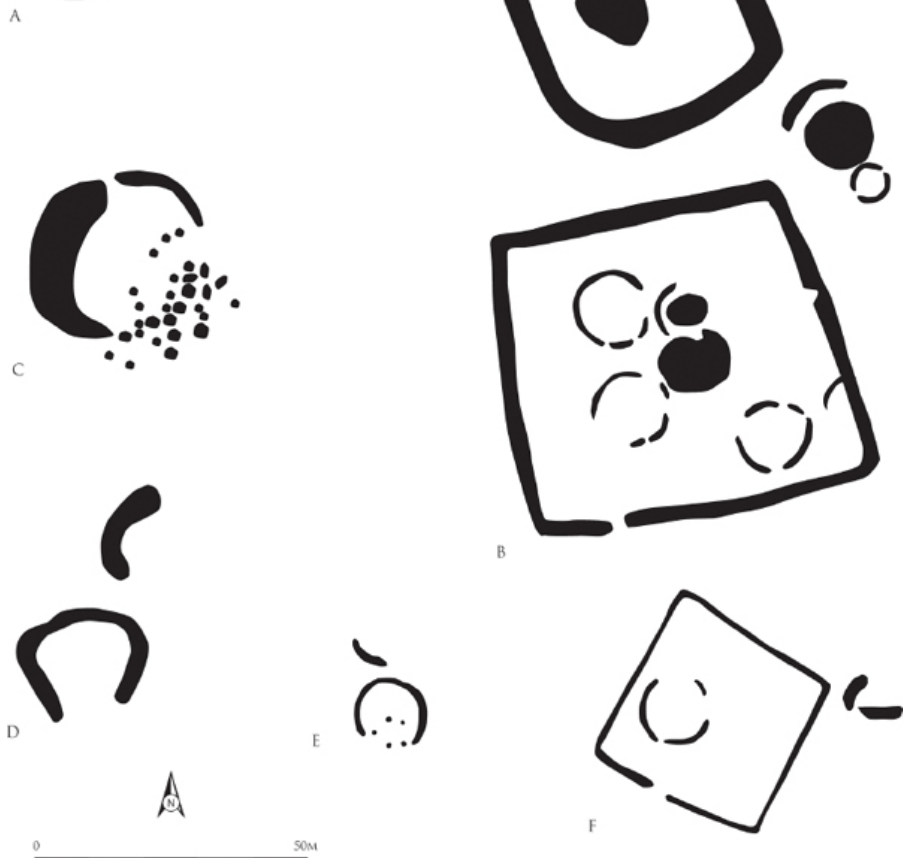
The Cults Loch souterrain, then, provides valuable insight into the relationship of the site type in SW Scotland to the wider pattern of souterrain construction, use and abandonment in Scotland more widely. The radiocarbon determinations, falling at the earlier end of the chronological range demonstrate that the southern appearance of souterrains cannot be attributed to a late spread from the northeastern heartlands, and might lead us to look to the earlier examples of the Atlantic west as closer comparanda (eg Miket 2002), despite the morphological and constructional differences.

The chronological misalignment with the eastern souterrain pattern accepted, however, there may still be grounds to consider the significance of the structure in the local economic context in the light of previous work on souterrains in the east. Storage of food surplus does seem a plausible explanation for the function of souterrains, and if the accrual of surplus can be taken as indicative of the emergence of local 'potentates' then it follows that this process must have been well underway by the 2nd or 1st century BC in SW Scotland. The stimulus cannot be attributed to the Roman presence in this area, but the timing would accord well with the documented widespread deforestation and associated intensification of farming apparent within the pollen record for the last centuries BC (Tipping 1997a, 20). It is possible that the construction of the Cults Loch souterrain indicates the production of agricultural surpluses that could only derive from large scale farming on a scale that had not occurred previously.

Souterrains in SW Scotland

Aerial photographic survey has greatly increased the number of known souterrains in SW Scotland via identification in the cropmark record. The fragmentary remains of souterrain sites distributed across Wigtownshire presumably indicate a more widespread pattern, considerably altering the northern and eastern bias thought previously to represent the extents of the souterrain distribution (eg Welfare 1984). While the Cults Loch example is the first such site in the southwest to be investigated, there are recurrent patterns in the aerial photographic record that might allow some comparison to be made more widely.

All of the examples in Wigtownshire appear to be timber lined ([Illus 142](#)), with none showing evidence in the aerial photography for stone lining that is occasionally visible in examples in Angus and Aberdeenshire (eg Armit 1999, [illus 3](#)), although the structure investigated at Glencloy on Arran might indicate the presence of stone examples, and records exist for souterrain-like structures that may have been stone-built in Buittle, Kirkcudbrightshire (NX85NW 9) and Ardeer, Ayrshire (NS24SE 23), though these cannot now be located or are destroyed. Where they have been identified, souterrains are most frequently associated with roundhouses and/or enclosures, and there may be some indication that they tend to be associated with later phases of activity, with suggestions that they post-date the enclosures or, as at Craigenholly (NX15NE 74) and Craigcaffie (NX06SE 88) are associated with apparently unenclosed roundhouses. In the case of Cairn Connel Hill (NX06NW 43) a souterrain may be associated with an unenclosed roundhouse, a pattern echoed at Hulton in Dumfriesshire (NX98SW 91). Rectilinear enclosures of the type found at Hulton and Cairn Connel Hill would typically be taken to date to the 1st century BC or 1st/2nd centuries AD on the basis of previously excavated examples in Northumbria and at Rispaan Camp, though admittedly the association of these unenclosed examples to the adjacent rectilinear enclosures cannot be taken as assured. Nonetheless, while the Cults Loch souterrain demonstrates that the southwestern souterrains need not be considered late developments outwards from the northeastern heartlands (cf. Armit 1999), by association we might reasonably consider that as a site type, souterrains in the south-west seem likely to have a similar currency to elsewhere in Scotland, probably concentrating in the last two centuries BC and first two centuries AD.



Illus 142. Souterrains in SW Scotland: A, Ballantrae; B, Cairn Connel Hill; C: Craigcaffie; D: Craigneholly; E: Aird Moss (after transcription by RCAHMS).

5 Cults Loch 2 and Cults Loch 6

Cults Loch 2; the knoll

In 1872 George Wilson had measured and planned the crescentic-shaped knoll in the terrestrialised area in the northwestern corner of the loch, and suggested that it might be artificial ([Illus 3](#)). Coring in this area in 2008 had established that it was natural but owing to its proximity to the other sites, it seemed likely that the knoll, which would have formed an island at times, had been used in prehistory. Consequently, during a rainy interlude in 2009 when the crannog was unworkable, a small, L-shaped exploratory trench measuring 11 m × 4 m was excavated over the southern slope of the knoll ([Illus 143](#)). The only feature encountered in the trench was a small cut feature, clipped by the W edge of the trench ([Illus 144](#)). The feature measured approximately 0.4 m by 0.4 m and 0.3 m deep and may have been a small pit or posthole. As such, although there was very little archaeology in the exploratory trench, the presence of further archaeological features on the knoll cannot be ruled out.



Illus 143. Cults Loch 2; the trench after cleaning



Illus 144. Cults Loch 2; the pit-like feature

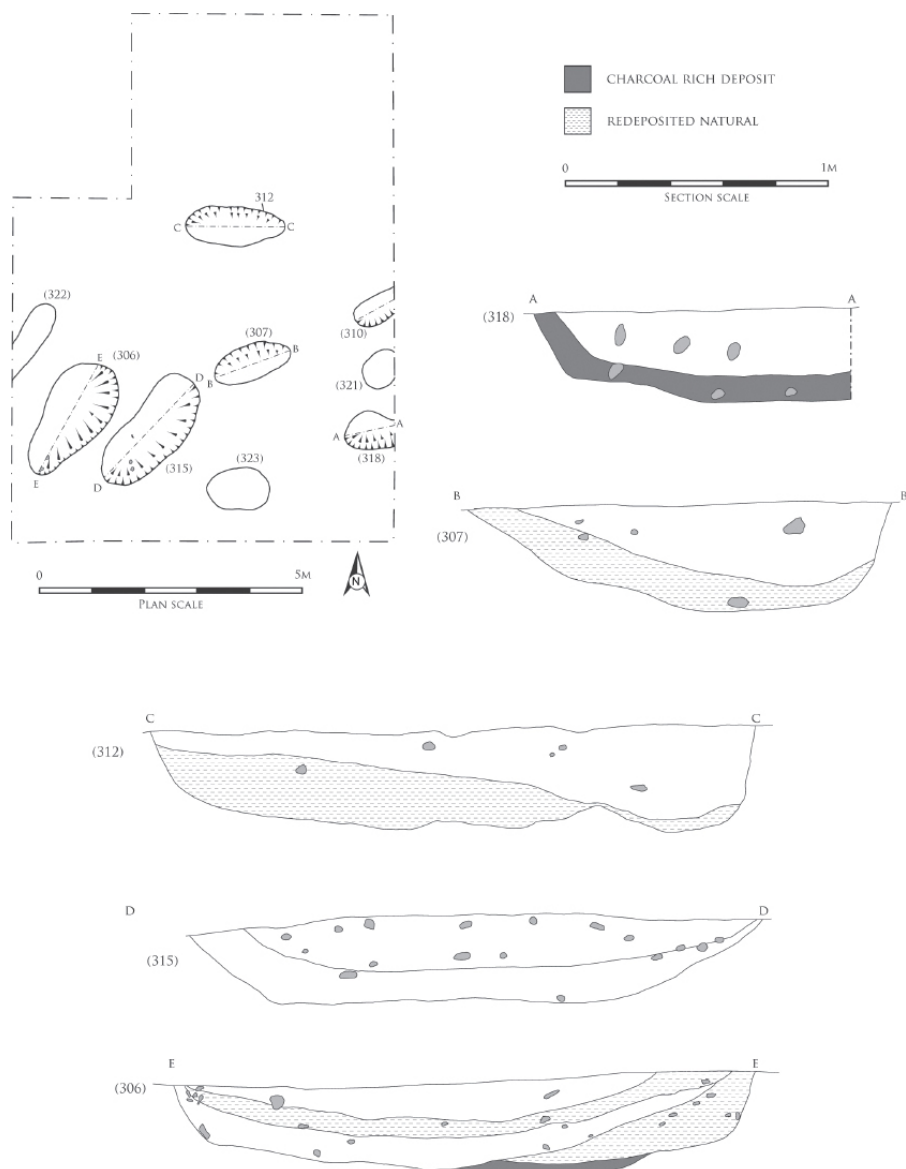
Cults Loch 6; the pits

In 2009 a small control trench was opened up to test whether there were other archaeological features in areas without cropmark evidence ([Illus 3](#)). The trench was located on a stretch of ground chosen at random on the N side of the loch 3. After topsoil stripping

and cleaning however, it became apparent that several large pits had been clipped by the trench, so the trench was extended to the W and an L-shaped area, 68 m² in area was investigated ([Illus 145](#)).

The trench contained a series of pits, mostly aligned NE–SW and in rows, though with some exceptions to this pattern ([Illus 145](#)). Nine pits in total were recorded, and six of these were excavated. The cuts of the excavated examples (301), (307), (310), (312), (315) and (318) were very similar, being steep sided but with flat or very shallow concave sloping bases. The sizes of the pits varied, but in plan they were all sub-oval in shape, and mostly with dimensions of around 2.20 m in length, 1.60 m in width and 0.3 m in depth. The fills of these pits were also similar. The majority of the fills were dark orange–brown sandy silts, but several of the pits had lower fills that were darker and more organic in nature, such as (320) at the base of (318) and (306) at the base of (301) ([Illus 145](#)). Several of the pits contained contexts with a high percentage of redeposited natural, though the profile of these deposits suggested that they represented natural erosion into the pit, rather than deliberate backfill in a single event.

No finds were recovered from any of the features. Though their dimensions and regular layout are suggestive of graves, nothing in the fills of the features was consistent with this interpretation, and the exact purpose is likely to remain uncertain without excavation of a larger area. A gradiometry survey was carried out over the area around the pits in an attempt to locate their extent and establish whether the site was more extensive than the excavated features, but the results were equivocal and no further features could be traced.



Illus 145. Cults Loch 6; plans and sections of the pits

A single radiocarbon date was obtained for charcoal recovered from the upper fill of pit (315), returned at 1695 ± 30 BP (SUERC-27894), calibrating in the range cal AD 250–420 at 2 sigma.

Discussion

The date range for the dated pit is very close to that obtained from Cults Loch 1, the crannog in the centre of the loch, which calibrates in the range cal AD 120–390 (GU-10919). It is therefore possible that the

features at Cults Loch 6 relate to some contemporary activity on the shore, albeit that the precise nature of this activity is unclear. The precise character of this site will remain unknown without excavation, but one possibility is that the site does indeed represent a burial ground of the type discussed by Cowley (2009). These small cemeteries of the 1st millennium AD have been identified through aerial photography across SW Scotland and are characterised by groups of aligned oblong, 'maggot-like' features. Such cemeteries may or may not be enclosed (Cowley 2009a, 47), and the graves may or may not be stone lined, as at the recently excavated example at Montefode (Hatherley 2009, 200), so that the apparently empty pits at Cults Loch 6 could well fit within the variability known to exist. If the site does indeed represent a cemetery, the relationship to the later Iron Age crannog in the loch is of key importance.

6 Radiocarbon dating and Bayesian modelling of Cults Loch 3, 4 and 5

Derek Hamilton & Tony Krus (SUERC)

A total of 51 radiocarbon dates are available from 39 samples of charred macrobotanical remains and waterlogged timbers, ten from Cults Loch 3, 13 from Cults Loch 4 and 16 from Cults Loch 5. The samples were single-entities (Ashmore 1999), and all were pretreated following Stenhouse and Baxter (1983). With the exception of GU-12138, the samples were combusted as described in Vandeputte *et al* (1996) with the graphite targets prepared and measured as described by Naysmith *et al* (2010). GU-12138 was measured by liquid scintillation counting (Noakes *et al* 1965). The SUERC laboratory maintains rigorous internal quality assurance procedures, and participation in international inter-comparisons (Scott 2003) indicates no laboratory offsets; thus validating the measurement precision quoted for the radiocarbon ages.

The radiocarbon results are given in [Tables 1, 12, 13 and 15](#). These are conventional radiocarbon ages (Stuiver & Polach 1977), quoted according to the international standard set at the Trondheim Convention (Stuiver & Kra 1986), and calibrated with the internationally agreed curve of Reimer *et al* (2013) using OxCal v4.2 (Bronk Ramsey 1995; 1998; 2001; 2009). The date ranges in the tables have been calculated using the maximum intercept method (Stuiver & Reimer 1986), and quoted with the endpoints rounded outward to 10 years. The probability distributions seen in [Illus 146](#) were obtained by the probability method (Stuiver & Reimer 1993).

Methodological approach

A Bayesian approach has been adopted for the interpretation of the

chronology at the three sites (Buck *et al* 1996). Although the simple calibrated dates are accurate estimates of the dates of the samples, this is usually not what archaeologists really wish to know. It is the dates of the archaeological events represented by those samples which are of interest. In the case of the Cults Loch radiocarbon dating, it is the overall chronology of the use of the individual sites – when did activity in each locus begin; when did it end; and for how long did it take place – that is under consideration, not necessarily the dates of any individual samples. The dates of this activity can be estimated not only using the absolute dating information from the radiocarbon measurements on the samples, but also by using the stratigraphic relationships between samples.

Fortunately, methodology is now available which allows the combination of these different types of information explicitly, to produce realistic estimates of the dates of archaeological interest. It should be emphasised that the *posterior density estimates* produced by this modelling are not absolute. They are interpretative *estimates*, which can and will change as further data become available and as other researchers choose to model the existing data from different perspectives.

The technique used is a form of Markov Chain Monte Carlo sampling, and has been applied using the program OxCal v4.2. Details of the algorithms employed by this program are available from the on-line manual or in Bronk Ramsey (1995; 1998; 2001; 2009). The algorithm used in the model described below can be derived directly from the model structure shown in [Illus 146](#).

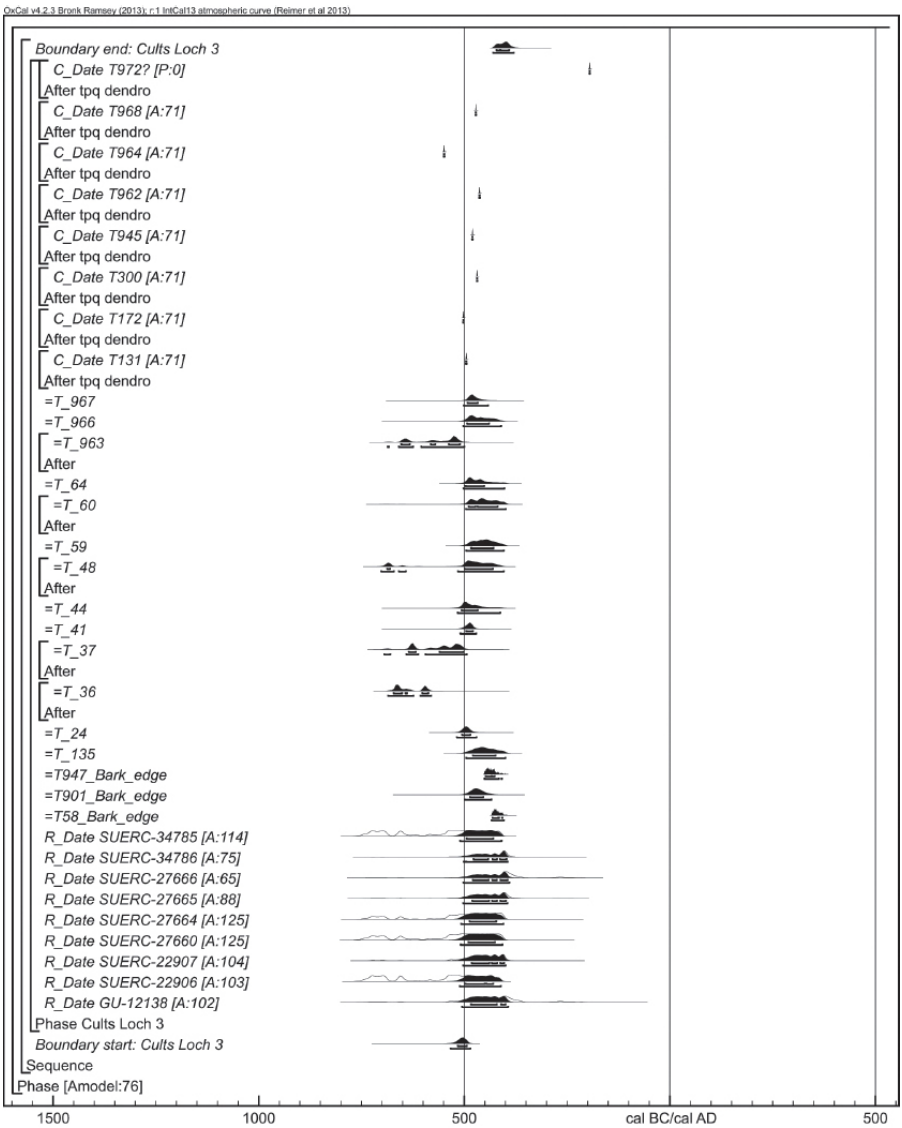
Cults Loch 3; the crannog

There are single radiocarbon dates on nine structural elements from Cults Loch 3 ([Table 1](#)), and a further 12 radiocarbon dates from a single timber, T901 ([Table 15](#)), which have been used in a Bayesian wiggle-match. A further nine timbers from the crannog were dated through dendrochronology, with two of these timbers retaining a number of sapwood rings.

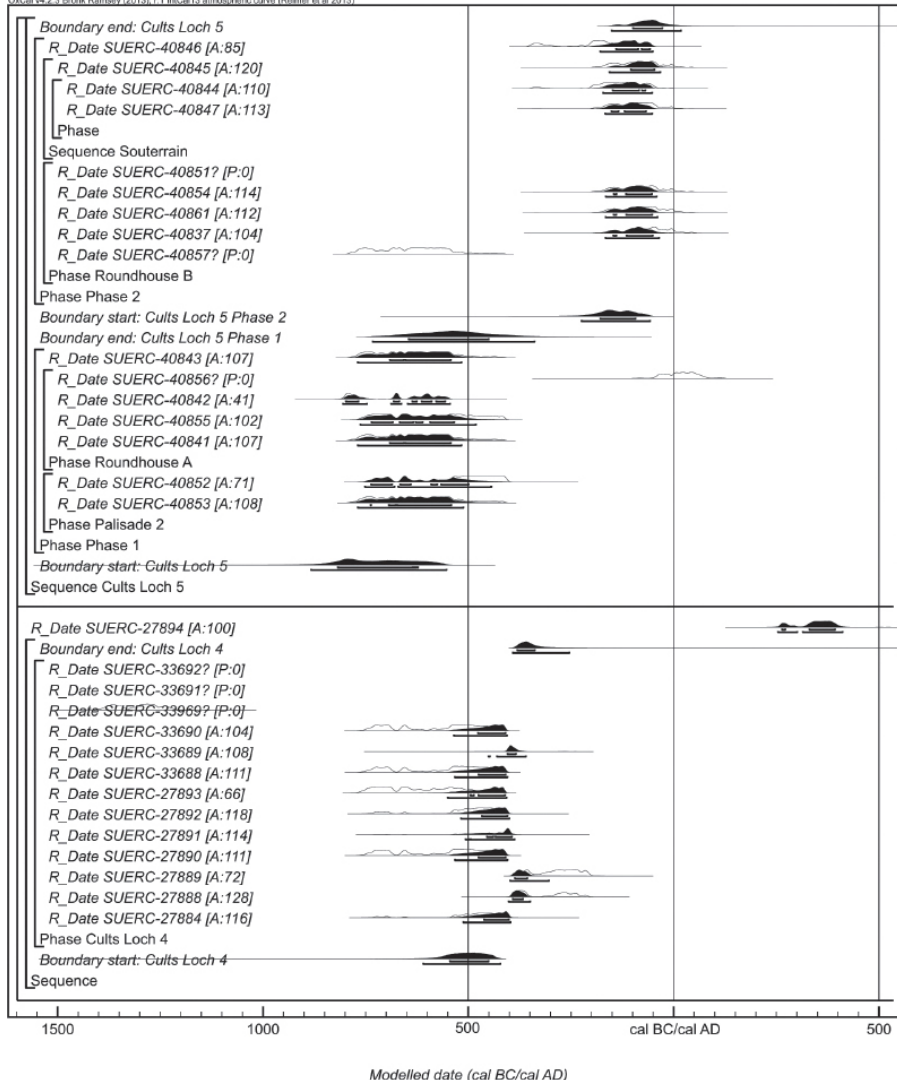
It was noted that T901 potentially ends at the heartwood/ sapwood (H/S) boundary ([Table 2](#)). The modelled date for the H/S boundary was subsequently offset by a sapwood probability derived from prehistoric English oak timbers with complete bark edge to arrive at an estimated date for the felling of the timber (see Hamilton *et al* 2007 for a description of the methodology used).

The dendrochronological dates for the H/S boundary of T58 and T947 were subsequently offset by modified probabilities that took into

account that these timbers had 3 and 11 sapwood rings intact, respectively (Table 2). The other seven timbers that were dendrochronologically dated (see Chap 2b) were included in the model, but the outer ring in every case was heartwood, and so these dates were included in the model as providing only a *terminus post quem* result for the felling of each timber.



Illus 146. Overall chronological model for all three sites in this study (continued opposite)



The remaining nine individual radiocarbon dates are from a combination of stakes, horizontal logs and spreads of material that included charcoal, plant macrofossils, and gravel. Additionally, the radiocarbon wiggle-matches that were made on 13 timbers (24, 36, 37, 41, 44, 48, 59, 60, 64, 135, 963, 966, and 967) as part of PhD research undertaken at SUERC (see [Chap 2b](#)) have been incorporated into this model, but without any constraints imposed on the ordering of Structure 1 or 2.

The chronological model that was constructed in OxCal assumed that all of these dates are unordered, should be uniformly distributed through time, and that they are representative of a period of relative continuous use at the site. There is good agreement between the

model assumptions and the scientific dates ($A_{\text{model}} = 76$).

Table 15. T901; radiocarbon determinations

Lab ID	Sample	Material	$\delta^{13}\text{C}$ (‰)	Radiocarbon age (BP)	Calibrated radiocarbon date (95% confidence)
SUERC-36782	1	waterlogged wood: <i>Quercus</i> sp. (alpha cellulose)	-24.9	2490 $\pm$ 30	790–490
SUERC-36783	2	waterlogged wood: <i>Quercus</i> sp. (alpha cellulose)	-26.5	2515 $\pm$ 30	800–540
SUERC-36787	3	waterlogged wood: <i>Quercus</i> sp. (alpha cellulose)	-25.7	2480 $\pm$ 30	780–430
SUERC-36788	4	waterlogged wood: <i>Quercus</i> sp. (alpha cellulose)	-25.6	2480 $\pm$ 30	780–430
SUERC-36789	5	waterlogged wood: <i>Quercus</i> sp. (alpha cellulose)	-25.9	2500 $\pm$ 30	790–510
SUERC-36790	6	waterlogged wood: <i>Quercus</i> sp. (alpha cellulose)	-25.6	2435 $\pm$ 30	760–400
SUERC-36791	7	waterlogged wood: <i>Quercus</i> sp. (alpha cellulose)	-25.9	2485 $\pm$ 30	780–430
SUERC-36792	8	waterlogged wood: <i>Quercus</i> sp. (alpha cellulose)	-26.0	2500 $\pm$ 30	790–510
SUERC-36793	9	waterlogged wood: <i>Quercus</i> sp. (alpha cellulose)	-26.1	2425 $\pm$ 30	750–400
SUERC-36797	10	waterlogged wood: <i>Quercus</i> sp. (alpha cellulose)	-26.7	2465 $\pm$ 30	770–410
SUERC-36798	11	waterlogged wood: <i>Quercus</i> sp. (alpha cellulose)	-25.8	2495 $\pm$ 30	790–510
SUERC-36799	12	waterlogged wood: <i>Quercus</i> sp. (alpha cellulose)	-26.2	2450 $\pm$ 30	770–400

The model (Illus 147) estimates that Cults Loch 3 was constructed in 535–480 cal BC (95% probability; start: Cults Loch 3), and probably in 520–490 cal BC (68% probability). The crannog might have been used for 60–145 years (95% probability; span: Cults Loch 3), but probably for 80–125 years (68% probability). Use and maintenance of the crannog ceased in 425–380 cal BC (95% probability; end: Cults Loch 3), and probably in 420–395 cal BC (68% probability).

Cults Loch 4; the promontory fort

There were no clear stratigraphic relationships between features on the promontory fort. As such the radiocarbon results from this site (Table 12) have been modelled in a similar fashion to the crannog, assuming that all of these dates are unordered, should be uniformly distributed through time, and that they are representative of a period of relative continuous use at the site. Three results (SUERC-33691/2 and -33969) have been excluded from this model as they are late Mesolithic/early Neolithic and Bronze Age in date. There is good agreement between the model assumptions and the radiocarbon dates ($A_{\text{model}} = 76$).

The modelling (Illus 148) suggests that dated activity on Cults Loch 4 began in 610–420 cal BC (95% probability; start: Cults Loch 4), and probably 545–450 cal BC (68% probability). Activity ended 395–250 cal BC (95% probability; end: Cults Loch 4), and probably in 385–335 cal BC (68% probability). This activity may have spanned 40–335 years (95% probability; span: Cults Loch 4), but probably 75–205 years (68% probability).

It has been proposed that Cults Loch 4 might have up to three phases of palisade construction. This would suggest some longevity to the use of the area, which is supported by the radiocarbon dating.

Cults Loch 5; the palisaded enclosure

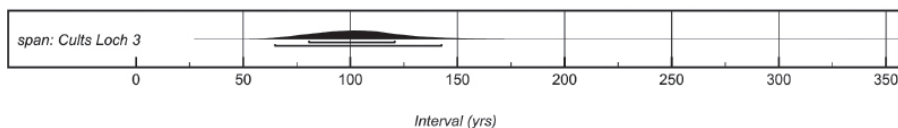
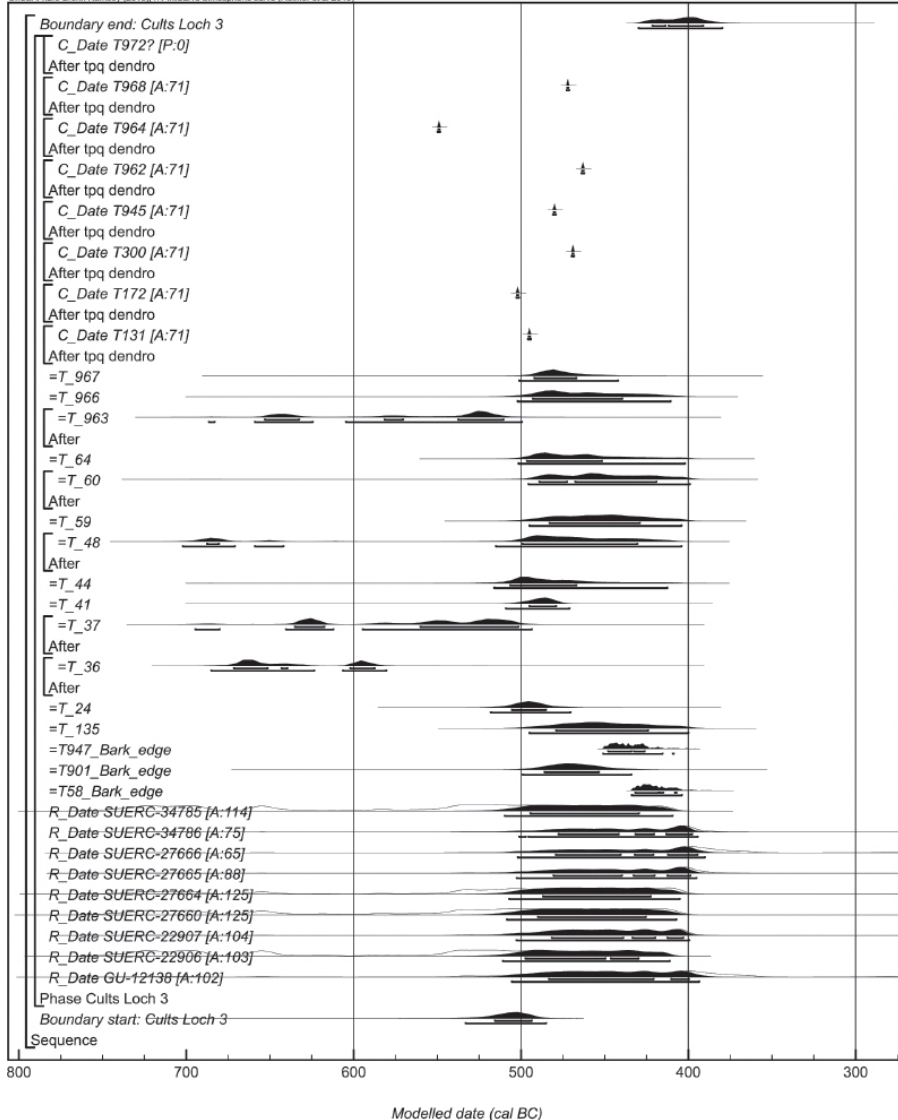
Cults Loch 5 was separated into two phases of activity based on the archaeological evidence (see [Chap 4 Chronological relationships](#)). The ditch and palisades were assumed to be contemporary because of their close concentricity, and Roundhouse B cut the palisade, therefore post-dating them. The initial phasing placed all the dated features, with the exception of Roundhouse B, in Phase 1. After the radiocarbon results were received this was altered so that the souterrain was also in Phase 2 with Roundhouse B.

The model places the results from each phase into a general unordered group (with the exception of a small amount of stratigraphy in the souterrain). The two phases are sequential and the model has been constructed to query the length of a potential hiatus between Phases 1 and 2.

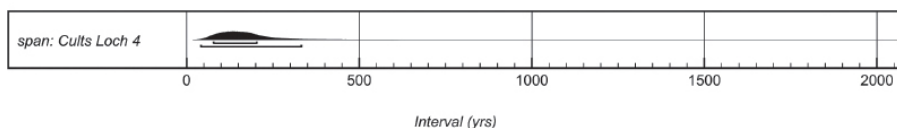
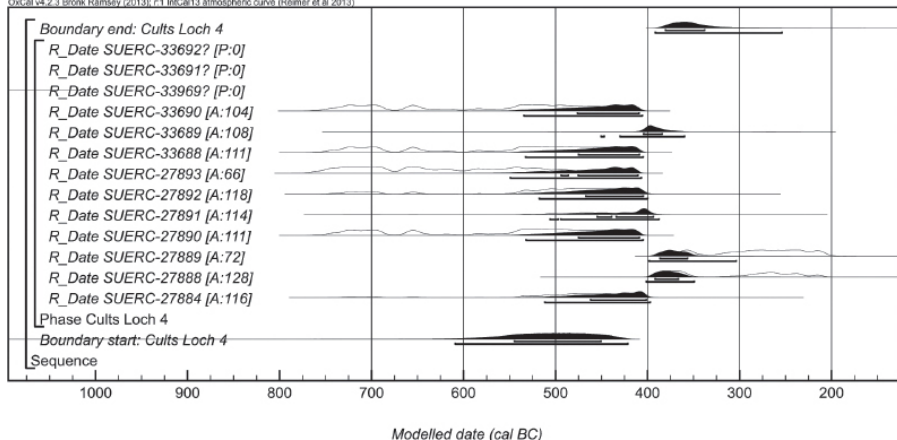
Some of the dates have been excluded from the modelling ([Table 13](#)). SUERC-40856 is significantly later than all other results from Roundhouse A and Palisade 2, dating to the late 1st century cal BC–early 1st century cal AD, and has been excluded from the modelling, as it is likely to be intrusive. SUERC-40857 is on a fragment of hazel charcoal from the fill (136) of a pit in Roundhouse B. The result is significantly earlier than the other radiocarbon results from Roundhouse B and the souterrain, and has been excluded as residual in the context. SUERC-40851 came from a fragment of alder charcoal from the fill (236) of another pit in Roundhouse B. The result is Neolithic, which suggests it is residual in this context, and so it has also been excluded from the model.

There is good agreement between the model assumptions and the scientific dates ($A_{\text{model}} = 76$).

The model ([Illus 149](#)) estimates that activity at Cults Loch 5 began in 885–550 cal BC (95% probability; start: Cults Loch 5), and probably in 820–620 cal BC (68% probability). This first phase of dated activity ended in 735–335 cal BC (95% probability; end: Cults Loch 5 Phase 1), and probably in 645–450 cal BC (68% probability). Phase 1 spanned as many as 475 years (95% probability; span: Cults Loch 5 Phase 1), but probably 1–240 years (68% probability).



Illus 147. Chronological model for Cults Loch3, derived from the overall model in Illus 146



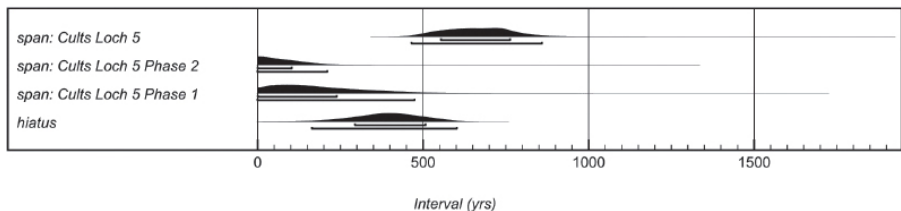
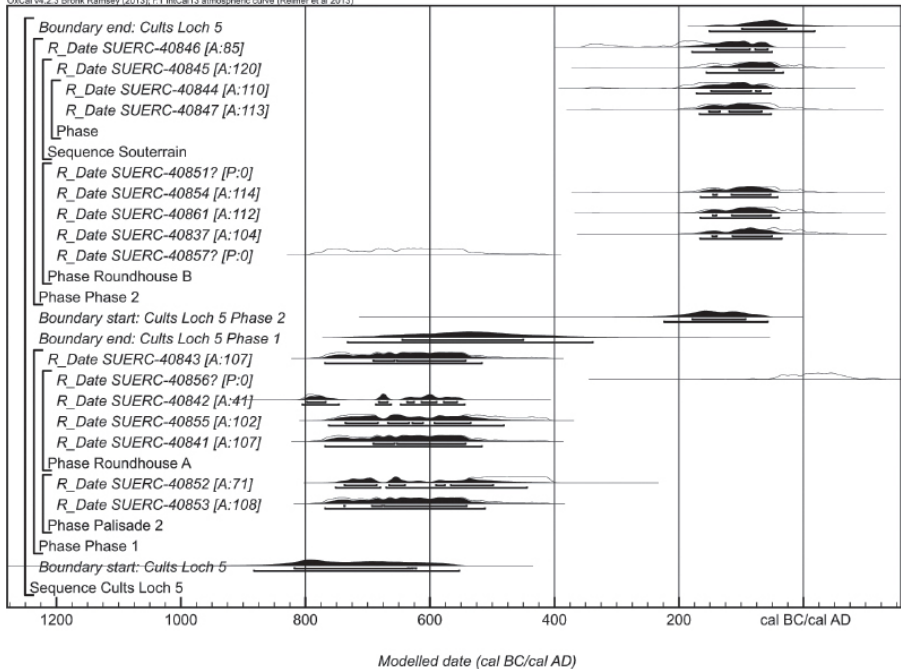
Illus 148. Chronological model for the Cults Loch 4, derived from the overall model in [Illus 146](#)

Table 16. Probability matrix that event τ_1 occurred before event τ_2

$\tau_1 < \tau_2$ τ_1	τ_2	start: Cults Loch 3	end: Cults Loch 3	start: Cults Loch 4	end: Cults Loch 4	start: Cults Loch 5	end: Cults Loch 5 Phase 1	start: Cults Loch 5 Phase 2
start: Cults Loch 3			100%	52%	100%	0%	38%	100%
end: Cults Loch 3		0%		0%	99%	0%	10%	100%
start: Cults Loch 4		48%	100%		100%	2%	40%	100%
end: Cults Loch 4		0%	1%	0%		0%	5%	99%
start: Cults Loch 5		100%	100%	98%	100%		100%	100%
end: Cults Loch 5 Phase 1		62%	90%	60%	95%	0%		100%
start: Cults Loch 5 Phase 2		0%	0%	0%	1%	0%	0%	

There is a hiatus in the dated activity that spans 165–605 years (95% probability; hiatus), and probably 290–510 years (68% probability). Phase 2 at the site began in 225–55 cal BC (95% probability; start: Cults Loch 5 Phase 2), and probably in 180–90 cal BC (68% probability).

The dated activity at Cults Loch 5 ceased in 155 cal BC–cal AD 20 (95% probability; end: Cults Loch 5), and probably in 100–25 cal BC (68% probability). Phase 2 at the sites spanned 1–215 years (95% probability; span: Cults Loch 5 Phase 2), and probably 1–105 years (68% probability).

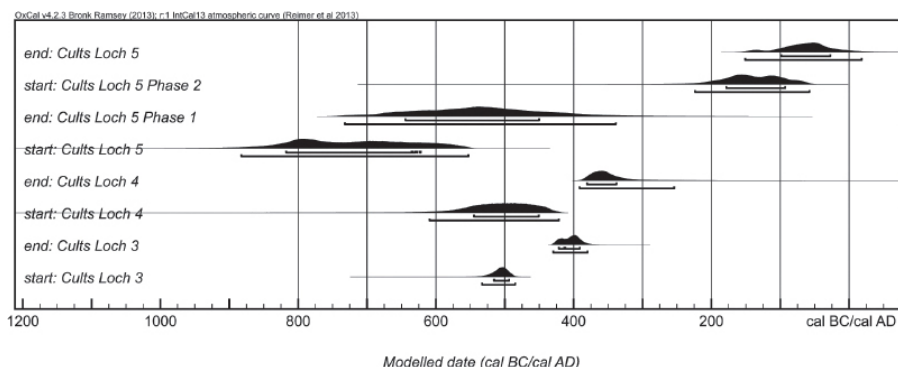


Illus 149. Chronological model for Cults Loch 5, derived from the overall model in [Illus 146](#)

Discussion

The low number of measurements, combined with the smearing effect of calibration in the Halstatt Plateau (c 800–450 cal BC), results in some elements of the models not being very precise (Steier & Rom 2000). However, the modelling has shown that there is a clear temporal distinction between the activity associated with the ditch, palisades and Roundhouse A, and the later souterrain and Roundhouse B ([Illus 150](#)). The modelling suggests that Phase 1 of Cults Loch 5 was the earliest of the three sites at Cults Loch, which was followed by the beginning of activity at Cults Loch 4. There is a 40% probability that Cults Loch 5/Phase 1 was still occurring when Cults Loch 4 was first constructed ([Table 16](#)). However, that phase of palisaded enclosure activity was almost certainly over before the end of activity at the promontory fort (95% probability).

Cults Loch 3 was certainly constructed after the commencement of Phase 1 at Cults Loch 5, with a 38% probability that crannog construction occurred prior to the end of this phase of activity. However, there is only a 48% probability that Cults Loch 4 activity began prior to the construction of the crannog at Cults Loch 3. This suggests that settlement occurred first at Cults Loch 5. Settlement moved to Cults Loch 3 and 4 either at the same time or at a very similar time. The dating also suggests that Phase 1 activity at Cults Loch 5 ended prior to the start of Cults Loch 3 (62% probability), and that activity at Cults Loch 3 ended prior to the end of activity at Cults Loch 4 (99% probability).



Illus 150. Probability distributions for date estimates for events identified in the chronological model for all three sites (Illus 146)

7 The material world of Iron Age Wigtownshire

Fraser Hunter, Dawn McLaren & Gemma Cruickshanks

Introduction

What can the finds of Iron Age Wigtownshire tell us? As the Cults Loch excavations show, individual sites can often appear impoverished, but this gives too negative a picture of the material's potential. A broader overview of finds from the area, both site and stray, modern and antiquarian, provides a much firmer basis for comment. The starting point of this study was a search of relevant literature and the museum catalogues of the National Museum, Glasgow Museums, the Hunterian Museum, Stranraer Museum and Dumfries Museum, for material of Iron Age date (c 800 BC–AD 400). This produced an extensive database of some 180 potential findspots. Many come from antiquarian collections, as Wigtownshire was fortunate in having a strong early tradition of collecting. Notable early figures were the Rev George Wilson of Glenluce, who collected especially in the Luce Sands area, and Sir Herbert Maxwell of Monreith, who acted as a conduit for a wide range of finds (eg Wilson 1878; Maxwell 1885; 1889). The early foundation of a local antiquarian society, the Ayrshire and Wigtownshire (later Galloway) Archaeological Association, acted as a stimulus for enthusiasts, and much of this material came to the National Museum.

This early tradition was picked up by two notable collectors of the earlier 20th century: Ludovic Mann, who collected widely but especially in the Luce Sands area (Ritchie 2002), and the Rev R S G Anderson, minister at Isle of Whithorn and subsequently Castle Kennedy. Sadly, the record-keeping of both was poor: much of their material is only weakly provenanced, and while Anderson's material is likely to be from Wigtownshire unless noted (other locations tend to

be marked), mostly from Luce Sands, Mann collected much more widely, making the material much less reliable. Other local collections of the period, such as the Selby collection from the Port William area, again mostly lack detailed provenance (Murray 2005). In the later 20th century, the collecting of Bill Cormack and Bert McHaffie in Luce Sands is noteworthy. The complex of sand dunes at Luce Sands dominates the area's find record, with thousands of artefacts from all periods, and is discussed further below.

Unfortunately over 110 of the potentially Iron Age stray finds had to be excluded, mostly because they cannot currently be closely dated (such as spindle whorls and coarse stone tools). This left a residue of 67 findspots, in the categories listed in [Table 17](#). Site assemblages are the main category, primarily from crannogs or island settlements ([Table 18](#)); a summary of the material is given in Appendix 7, where references to individual sites may be found. Stray finds are also commonplace (Appendix 8), and clusters of stray finds are considered as likely site locations. The material from Luce Sands, which represents a conglomeration of sites, is dominant, while smaller clusters are known from Airrieolland (where a crannog and enclosure are known), Barhullion (near a hillfort), Carleton, and Stelloch. Carleton may be linked to a mining site, discussed below, while the nature of the Stelloch finds hints at a votive site. Two unusual finds were turned up on the farm during ploughing on separate occasions: a Roman bronze statuette of the god Mercury ([Illus 151](#)), and a miniature axe-amulet (*PSAS* 11, 123; Curle 1932, 376–377; Maxwell 1885, 42, fig 36). The axe is clearly not functional: it has no socket, and the decoration is restricted to one side only. Similar axe-amulets are known elsewhere in Iron Age contexts (Robinson 1995, esp fig 1 no 1, a LIA example from Arras, E Yorks), and this is a likely date for this one. Two such remarkable finds suggest a locus of votive deposits.



Illus 151. Bronze statuette of the god Mercury from Stelloch. © Trustees of the National Museums of Scotland

Table 17. Character of the material studied

<i>Context</i>	<i>No</i>
Site	26
?Site	5
Burial	3
Hoard/votive	6
Stray	22
Collections	5
Total	67



Illus 152. Unfinished bronze cauldron from Awhirk. © Trustees of the National Museums of Scotland

A number of other stray finds are likely to have been deliberately deposited, plausibly as part of Iron Age belief systems. A long-lived series of vessel deposits found in Dowalton Loch, running from the late Bronze Age into the high medieval period, has been interpreted in this light (Hunter 1994). The unfinished bronze cauldron from Awhirk ([Illus 152](#)) and wooden vessels from Kirkchrist ([Illus 153](#)) and Dalvaired Moss, all from bogs, are likely to be similar ritual deposits (Hunter 1997, 118–119). The placing of vessels in such wet areas may reflect rituals connected with fertility; the deposition of so-called ‘bog butter’ at Barnkirk, Penninghame (Mowat 1996, 12) may be a similar offering, although practical motives of preservation are also possible (Earwood 1993, 13–14; Hunter 1997, 119; Synnott 2010). The motives behind burial of two late Roman coin hoards, at Balgreggan and Stranraer, are less certain.

Burials with grave goods are rare. One, from Barhobble, comprises an Iron Age bangle in an Early Medieval burial (Cormack 1995, 72, 36, fig 36.1). The others come from Luce Sands. Most striking is the High Torrs cremation burial with a range of grave goods, including Roman items. This is often seen as a Roman burial, although it could as plausibly be a rich Iron Age one. Another burial now survives only as a note accompanying some yellow globular glass beads in Stranraer Museum, from Rev Anderson’s collection, stating simply ‘found in a grave’.

<i>Site type</i>	<i>No</i>
Crannog	13
Enclosure	5
Promontory fort	3
Broch/dun	2
Open settlement	2
?	1

? represents Whithorn, where the nature of the Roman Iron Age material is unclear



Illus 153. Wooden vessel from Kirkchrist. © Trustees of the National Museums of Scotland

The excavated sample is a very partial and biased one. After a burst of work in the late 19th century, focussed especially on crannogs, very little excavation took place in Wigtownshire until relatively recently. The work on the enclosure at Rispaan in 1978–81 (Haggarty & Haggarty 1983) was a precursor to a developing interest in the area, with both crannogs and dryland sites seeing more work, but the quantities are still sparse compared to other areas. Development control archaeology offers the potential of redress: the unpublished material from Fox Plantation, on the line of a gas pipeline, and the A75 Dunragit Bypass both offer significant samples of later prehistoric landscape and good finds assemblages for study; the former, though still unpublished, was accessed in Stranraer Museum, while the latter is still undergoing study at the time of writing. Yet the range of excavated sites remains small and dominated by crannogs, with none of the dominant hillfort sites (such as Cairn Pat, Tor of Craigoch or Fell of Barhullion) examined, very few promontory forts, and only a few of the wide range of stone-walled enclosures. Indeed, two of these excavated enclosures (Chippermere and Airyolland) lack any clear

dating evidence, and are classed as Iron Age based on faith rather than fact. Despite this partial picture, there are patterns which are worthy of note.

Table 19. Iron Age finds from Luce Sands (some of the cannel coal / shale finds and the glass dumb-bell toggles could date to the later first millennium AD)

<i>Material</i>	<i>Artefacts</i>
Copper alloy (7)	Dumb-bell toggle *2 matched cast rings (bridle bit?) 6 Iron Age brooches: Nauheim variant, involuted, 2 one-piece brooches, La Tène III brooch with false spring, *Colchester
Glass (38)	Bangle × 2 (3A) (plus a toggle made from a reused type 2 bangle) Annular blue beads (9 + 4*) Opaque red × 2 Yellow annular × 8 Yellow annular × 8 Guido class 10 (Meare spiral) Guido class 13 (triangular spiral) Dumb-bell toggle × 4
Crucible (2)	2 (one triangular, one ?)
Shale/cannel (241)	Bangles × 144 (20 unfinished; 9 repaired; 21 reworked, as beads or pendants) Beads × 49 (16 unfinished) Finger rings × 26 (4 unfinished) Pendants × 17 (ring pendants, tusk pendants; 4 unfinished) Toggles × 9 Roughouts, product unclear × 6
Roman finds (6)	Silver intaglio finger ring 2 trumpet brooches 2 melon beads Late Roman AE coin of Magnentius c1000 3rd–4th century coins from Piltanton Burn area (plus High Torrs burial with samian, coarse ware, intaglio finger ring)

Items marked * are from the Anderson collection, plausibly but not certainly from Luce Sands.

Luce Sands

In terms of quantity and range of material, Luce Sands dominates the picture, with over 300 finds of likely Iron Age date – more than the rest of the excavated sites put together (Table 19). A small number of such sand dune sites across Scotland account for vast numbers of antiquarian finds: Luce Sands, Stevenson Sands in Ayrshire, Culbin Sands in Moray, and Fendom Sands in Ross-shire. These were clearly favoured hunting grounds for early collectors, and names such as Flint Howe in Luce Sands show how the wealth of material shaped people's

perceptions of the landscape. But a perennial question is how far can these sites be taken as typical (which would imply a substantially higher original finds density across the country than we recover; Clarke 2004, 47–48), and how far does it relate to the ease of spotting finds in sand, a collector’s gold-rush to such sites, or the nature of their location, on open bays with good sea connections (Bradley *et al* 2016)?

A series of findspots linked to different farms are recorded: Clayshant, Genoch, High and Mid Torrs, but little of the material is closely provenanced and it can really only be treated as a single group. One must remember that the impressive total assemblage comes from a substantial area, and is an amalgamation from an unknown number of Iron Age sites or clusters, making it less overwhelming in contrast to the extreme amounts of earlier prehistoric material. The random nature of sand-blows provides a sample which went beyond ‘sites’ (which are the focus of planned excavation elsewhere), taking in features such as craft foci or off-site spreads such as middens or fields. This suggests that at one level the dunes give a useful picture which can be taken as a broad backdrop to the study of the area’s material culture. Yet they also acted as an interface zone with the wider world and a manufacturing area, features seen as characteristic of ‘beach markets’ in earlier and later periods (Bradley *et al* 2016). We should be wary of straightforward analogy, as functions clearly changed over time. With Luce Sands, for instance, the relative scarcity of early Roman material is noticeable in contrast to the quantities of later Roman coins (indicating it was a contact point at this period), while only certain manufacturing activities are represented: there is little metalworking, often seen as the most prestigious of crafts. Clearly the Sands had a shifting role over time, which remains only partly revealed.

Table 20. Material categories represented from different find contexts

	<i>Coarse stone</i>	<i>R</i>	<i>CuA</i>	<i>Glass</i>	<i>Shale</i>	<i>Org</i>	<i>Fe</i>	<i>MWD Fe/?</i>	<i>MWD CuA</i>	<i>Pot</i>	<i>Pb</i>	<i>Bone/ antler</i>	<i>Ag</i>	<i>Amber</i>
Site	18	8	7	9	6	4	6	4	4	1	2	1	–	1
?Site	4	4	4	1	1	–	–	1	–	–	–	–	1	–
Burial	–	–	1	2	–	–	1	–	1	1	–	–	–	–
Hoard	–	2	4	–	–	2	–	–	–	–	–	–	–	–
Stray	5	11	8	5	3	2	–	–	–	–	–	–	–	–
Collection	5	–	1	3	3	–	–	–	–	–	–	–	–	–
Total	32	25	25	20	13	8	7	5	5	2	2	1	1	1

R: Roman; CuA: copper alloy; Org: organic; Fe: iron; MWD: metal-working debris; Pb: lead; Ag: silver. Roman finds are also recorded under their relevant material category

Material patterns

Table 20 shows the tally of different categories of material, ranked left to right by overall frequency. This is of course distorted by patterns of survival, some expected, some less so. The indestructible stone tools are the commonest finds. The relative lack of iron objects is all too common in acid Scottish soils, while the relatively high representation of organic material (wood and leather) reflects the frequency in the area of waterlogged crannogs and stray finds from peat bogs (leather is only found on one site, Dowalton, where it is early Medieval in date). Despite this waterlogging, bone and antler artefacts are all but unknown, with only a single find from one crannog. This is especially puzzling when compared to the Ayrshire crannogs excavated around the same time and in a similar environment, where bone and antler objects were common finds (Munro 1882). It may be that the large quantities from Ayrshire sites arise from midden deposits which generated a more favourable micro-environment; for instance, the only unburnt bone from the Dorman's Island crannog came from more clay-rich deposits (Cavers *et al* 2011, 89) and the bone recorded by Munro at Buiston crannog was principally recovered from contexts with raised pH levels which encouraged preservation (O'Sullivan 2000, 155). Their absence from Wigtownshire crannogs may thus simply be the happenstance of trench location, with middens normally occurring beyond the edge of the crannog platform itself (although bone was clearly recovered in some quantity from Dowalton; Munro 1885, 87–88).

Indigenous pottery is also rare, as Maxwell remarked over 100 years ago (1889, 226–267). Pottery is essentially unknown after the late Bronze Age; only the recently excavated enclosure site of Whitecrook has produced any, but this may all be LBA. Small, fractured sherds of pottery were also noted at Cults Loch 5 but this appears to be residual early prehistoric material with some of the sherds deriving from a feature associated with a Neolithic date. Despite the recovery of tiny abraded fragments of burnt clay from Cults Loch 3, no pottery was present. It does seem that the area was genuinely aceramic – none has been recognised from the rich pottery collections from Luce Sands. This is in contrast to other areas of lowland Scotland where pottery is found regularly but in small quantities (Hunter 2009a, 144). As the evidence of crucibles and fragments of burnt clay shows, this absence was not due to lack of skill or raw material, but represents a cultural choice, the preferred vessel forms presumably being wood or bronze (which do survive) or leather (which does not); some of the copper alloy finds are best interpreted as mounts on organic vessels (eg MacGregor 1976, no 335, from Dowalton).

Stone

Coarse stone tools, including cobble tools and querns, are the most prolific surviving component of Wigtownshire's later prehistoric material culture with over 300 individual items recorded from 34 find locations and collections ([Appendix 5](#)). The vast majority of these (198) come from antiquarian collections, mostly but not all the result of extended campaigns of collecting stray finds over a wide area. In the case of the Selby Collection, now in Stranraer Museum, Jane Murray notes that 'William Selby is said to have asked local ploughmen to look out for unusual stones. Occasional mention of circumstances of recovery include items being picked up during agricultural operations, while others had been preserved as curiosities' (2005, 159). It can be expected, therefore, that this collection and others like it comprise an unrepresentative selection of stone items with a bias towards more unusual or heavily worked, more aesthetically appealing and complete examples with an under-representation of lightly used stones (particularly cobble tools such as strike-a-lights, smoothers or polishers) and fragmentary objects. In addition, although we can be reasonably certain of the later prehistoric date of some of them, early prehistoric material will be present and chronological resolution remains problematic. Modern excavations in Wigtownshire are few, but the stone assemblages deriving from such interventions are helping to fill the gaps left by the deficiencies in the antiquarian collections.

Despite this wealth worked stone remains understudied and as a result poorly understood. This has been highlighted as an obstacle to more detailed interrogation of patterns of manufacture, use and deposition (Engl 2007, 290). Herbert Maxwell's (1889) discussion of stone tools in Wigtownshire remains the most comprehensive and detailed examination of worked stone artefacts from this area to date; the time is ripe for a return to this material.

The proliferation of worked stone amongst the Wigtownshire assemblages can be attributed to two key factors: the near indestructible quality of the material resulting in a bias in their survival over items of metal or bone, and the unmistakable signs of modification on items such as heavily used whetstones or quernstones which ultimately leads to higher recognition rates as stray finds. Typically, the activities represented by these tools are everyday tasks such as the processing of foods and the preparation of hides. Other prosaic, everyday activities such as textile manufacture and stone working are only occasionally represented, highlighting the partial picture of prehistoric economic crafts that survive through the

material record.

Table 20 shows that most material considered here comes from excavated sites of Iron Age date (18), with finds also recorded from unexcavated probable site locations (4) as well as stray finds and antiquarian collections. Stone finds are entirely absent from burials or hoards.

Over two-thirds of the excavated sites have at least one stone tool present amongst the assemblage but the proportion of stone finds from these sites is never large when compared with similar dated assemblages from south east Scotland (eg East Lothian; Hunter 2009a, table 7.7) or Atlantic Scotland (Clarke 2006). The absence of items of coarse stone but presence of artefacts of different material categories at some sites, such as at Crammag Head, Dally Bay and Ravenstone Moss, may be explained by the lack of formal excavation or differing methodologies for collection. In some cases, however, the paucity of stone objects appears to be a real one. Although Iron Age occupation was demonstrated at the settlement site at Aird Quarry no items of worked stone were associated with the later prehistoric features (Cook 2006).

The average number of stone finds from Iron Age sites in Wigtownshire is seven. This ranges from from a single tool, such as an unfinished spindle whorl from the dun at Airyolland (Cavers & Geddes 2010) to Cults Loch 3 where 31 items were found (McLaren, *infra*). Assemblages comprising ten or more coarse stone tools are rare and are only known from four sites: Black Loch of Myrton (Maxwell 1889, 214), Airrieolland (Munro 1882, 112–115), Fox Plantation (GUARD, unpublished) and Cults Loch 3 (McLaren, *infa*).

Quernstones

One of the most common stone tool types from Scottish Iron Age sites are quernstones which were used principally to grind cereals into flour for cooking. Evidence for alternative use of both saddle and rotary stones as grinding tools for processing other foodstuffs and materials such as pigments or ores has been noted elsewhere (Heslop 2008, 65–66) but remains rare in Scotland. None of the quernstones from Wigtownshire display evidence of this kind of alternative function but it is important to bear in mind that the use of later prehistoric quernstones may not simply be restricted to ‘domestic’ food processing activities.

The number of quernstones (saddle and rotary) from Wigtownshire is very small. Those from excavated sites (15 examples from seven sites) form a limited but interesting group. Stray finds and antiquarian

finds provide only an additional nine examples, all rotary querns. Two stray finds of saddle querns from Mochrum were noted by Maxwell (1889, 217) and five ‘quernstones’ were mentioned by Munro (1882, 49) from the vicinity of Dowalton Loch but no further information on these items survive and their current whereabouts are unknown. This restricted number and distribution of querns is unexpected, particularly in comparison with regions such as East Lothian where querns are one of the dominant stone tool types recorded (Hunter 2009a). The small number of querns in antiquarian collections is also surprising and may reflect a bias in collecting policy, an uncertainty over their antiquity due to the extended period of rotary quern use in some areas of Scotland (Fenton 1978, 388), or simply a lack of interest in collecting tools of this form. But these attempts at explanation are not entirely convincing, especially given the similarly small number of quernstones from excavated assemblages. This is a point that will be returned to later.

In light of this apparent scarcity, the collections of querns from Cults Loch 3 and 5 form an important addition, representing almost a third of the area’s total. Cults Loch 3 produced a rare example of a matched upper rubbing stone and lower saddle quern (SF 10/02 and SF 10/25) as well as a partially reworked saddle quern that may have been in the course of transformation into a rotary stone (SF 10/10).

This near-invisibility of saddle querns is unlikely to be a true reflection of prehistoric use. Fragmentary stones may well have been missed in earlier excavations, having only been identified from Iron Age contexts in the recent Cults Loch work. Yet complete saddle querns are rare; only four other examples are recorded, from the Iron Age promontory fort at Carghidown, a later prehistoric roundhouse at Whitecrook Quarry (DES 2006, 52–53; Gordon 2009), an unpublished prehistoric (probably Late Bronze Age) site at Soleburn (GUARD unpubl) and an undated stray find from Torhouse (unpubl: CANMORE ID No: 62869).

Table 21. Rotary querns from Wigtownshire

<i>Site</i>	<i>Site type</i>	<i>No stones</i>	<i>Upper stone</i>	<i>Lower stone</i>	<i>Other</i>
Teroy, Inch	site, broch	1	1 bun	–	
Barlockhart Loch	site, crannog	2	1 bun; 1 incomplete bee-hive	–	
Cults Loch 3	site, promontory crannog	(see other)	–	–	1 possible reworked saddle quern/unfinished rotary stone
Cults Loch 5	site, enclosure	3	1 incomplete bee-hive	1	1 possible rotary quern fragment
Fox Plantation, Inch	site, open settlement	2	2 incomplete disc	–	
Anderson Collection	Antiquarian	6	5 bun-shaped; 1 beehive	–	
Luce sands	?site	1	1 incomplete disc	–	
Stranraer	Stray/antiquarian	1	1 decorated disc-quern	–	

The transition from the principal use of saddle querns to the more efficient rotary technology remains fuzzy, due in part to the persistent use of saddle querns alongside rotary stones. With the benefit of new discoveries, such as rotary querns from early phases at The Howe, Orkney (Ballin Smith 1994, 26), previous suggestions of a transition date of around 200 BC now appear too late (Caulfield 1978; Armit 1991, 190–195). Current evidence suggests that this introduction to rotary quern technology took place about 200 years earlier (McLaren & Hunter 2008, 105; Peacock 2013), but the Wigtownshire evidence offers little help in refining this. At Cults Loch 3, one saddle quern (SF 10/10) has been modified after use and may have been in the process of re-working into a rotary quernstone. This observed re-working appears unique. Its context of recovery, from the decay horizon attributed to Phase 5, means that close dating is not possible as this amorphous organic layer appears to contain a number of sub-phases of poorly defined conflated occupation and structural elements, but the dendrochronological evidence from the site points to the 5th century BC as the main episode of settlement activity.

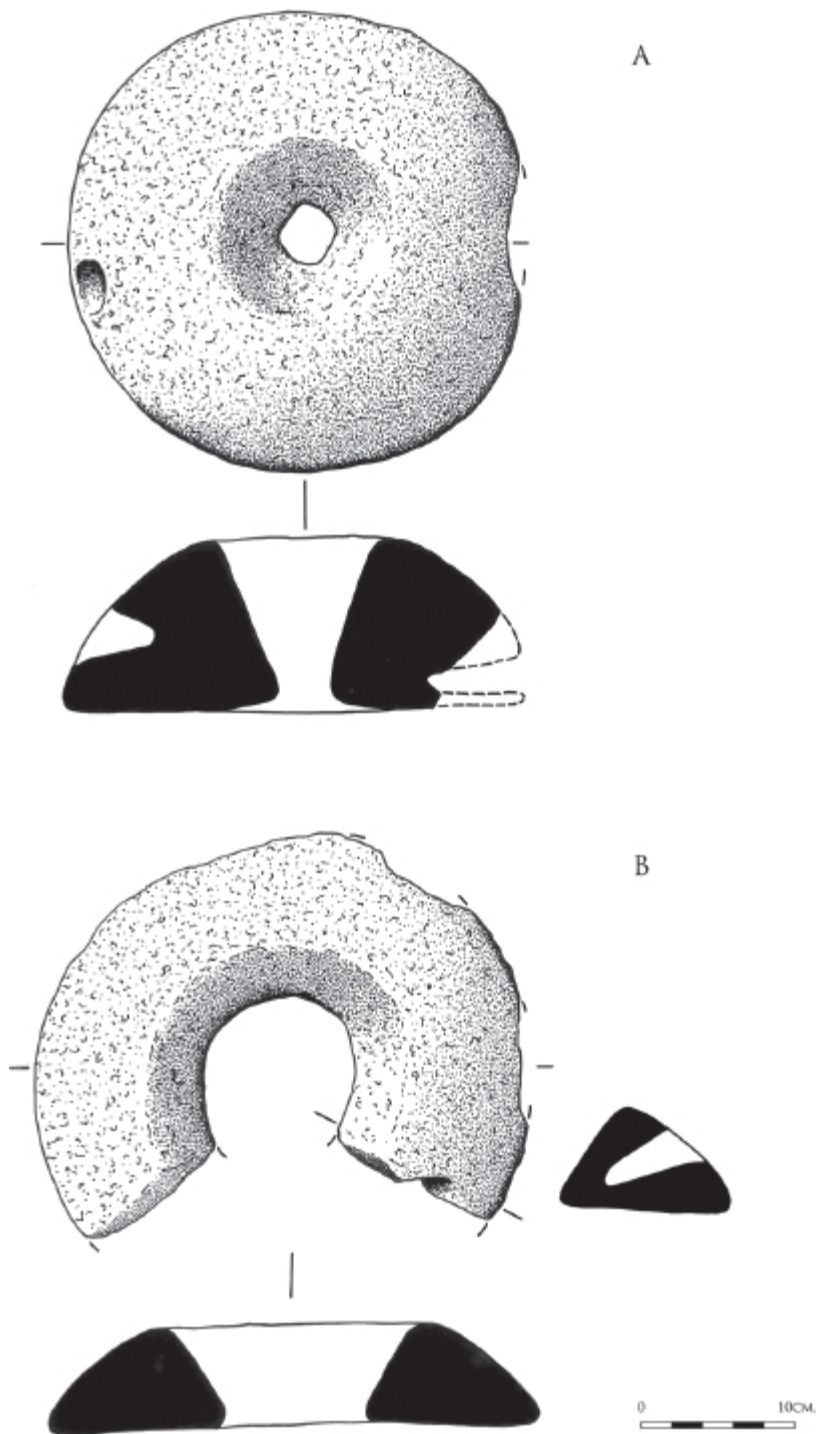
The restricted number of saddle querns in the area is mirrored by the low number of rotary stones: only nine examples have been recovered from four excavated sites ([Table 21](#)) with a further eight upper stones (minimum number) recovered as stray finds. In addition, there is a reworked saddle quern from Cults Loch 3 noted above.

Two main forms of rotary quern were in use in southern Scotland during the Iron Age. These comprise bun-shaped and beehive quernstones, the types being distinguished by the form of the upper stones; low, rounded, bun-shaped querns and thicker, more robust steep-sided or rounded beehive querns. Bun-querns are believed to dominate the picture throughout most of southern Scotland during this period (MacKie 1971, 52–55). A third type, disc-shaped quernstones, are also present but the prolonged use of this form, currently thought to extend from around the 5th or 4th century BC (McLaren & Hunter 2008, 105) to the early 20th century in many areas (Fenton 1978, 388), means that they are difficult to date unless they are found in a secure Iron Age context or include a characteristically Iron Age decorative scheme or handling system (see McLaren & Hunter 2008). As such, disc querns which lack such associations or characteristics have not been considered here.

With the exception of one well-stratified lower stone from Cults Loch 5 (SF 12), all of the rotary quernstones from Wigtownshire are upper stones. All three quernstone forms are represented amongst this group: bun-shaped upper stones from Barlockhart Loch ([Illus 154a](#))

and Teroy, beehive stones from Barlockhart Loch ([Illus 154b](#)) and Cults Loch 5, and heavily fragmentary pieces of disc quern from Fox Plantation ([Illus 157](#); GUARD: unpubl). The mixture of quern forms suggests more heterogeneity in Wigtownshire during the Iron Age than previously recognised. Whether this is a reflection of chronology, individual style or other factors cannot currently be determined but future cross-regional studies may help to illuminate this matter. It is clear that rotary querns are associated with a wide range of site types, with stones being recovered from brochs, crannogs, open settlements and palisaded enclosures.

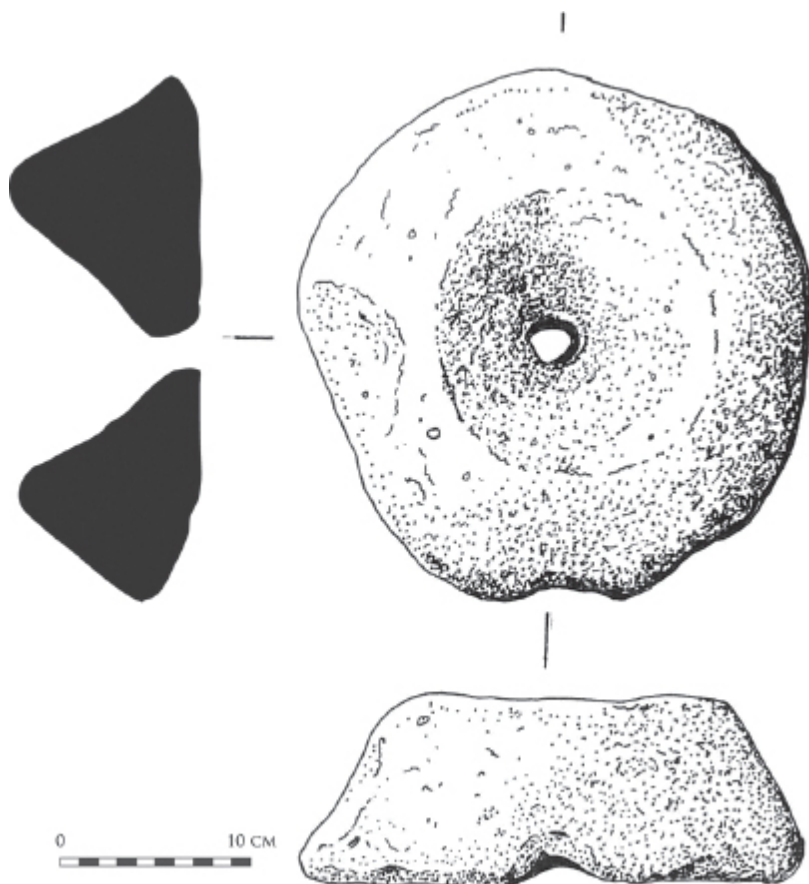
The upper beehive quern from Cults Loch 5 (SF 8) is a particularly significant find due to the rarity of this type from southern Scotland. Beehive querns are the predominant later prehistoric quern type in southern Britain but see a more limited distribution in the north (Heslop 1988; 2008). Only 53 examples from Scotland and northern England have been previously recorded (J Cruse, pers comm) with concentrations in East Lothian and the Borders. Very few querns of this type are known in SW Scotland but include a deliberately fragmented example from Barlockhart Loch, Wigtownshire (NMS: X.BB 75; [Illus 154b](#)) and an exceptionally worn but intact beehive upper stone from Wigtownshire in the collections of Stranraer Museum (unpubl; Accession Number TN462; [Illus 155](#)). Further afield, a complete upper stone is known from Camp Hill, Trohaughton, Dumfriesshire (Simpson & Scott-Elliot 1964, 133) and there is a possible beehive quern fragment amongst a collection of broken up stones found within the ditch of the multiperiod “henge” site at Pict’s Knowe, Dumfriesshire (Thomas 2007, 152; J Cruse, pers comm). A stray find comes from Lochfoot, Lochrutton (MacKie 1996, 108) and one was found while draining a wet hollow on Margmony Farm, Tynron, Dumfries & Galloway (Truckell 1966, 201). A further possible example, found on a stone heap at Drumsleet was described as a ‘high domical upper quernstone of coarse granite’ (DES 1971, 25) and an upper stone was noted at a crannog at Loch Quien, North Bute (Cavers 2003, 39).



Illus 154. a. Bun-shaped upper rotary quernstone; b. deliberately fragmentary beehive quernstone, both from Barlockhart (NMS: X.BB 74 & 75). Illustration by Alan Braby

The condition of the rotary stones from Wigtownshire is of

particular interest as it highlights a significant distinction between the character of finds from excavated sites and those from antiquarian collections. The latter, such as those in Stranraer Museum, are predominantly intact stones and are dominated by bun-shaped upper stones (Illus 156a). Where handle sockets are preserved they are typically horizontal sockets which have been pecked or bored into the sides of the upper stone although one example has a replacement vertical socket (Illus 156b). In terms of size, the bun-shaped querns range from 300 mm to only 235 mm in diameter and 120 to only 55 mm in height. None display any signs of decoration or alternative handling systems. A range of wear is also present, from a possible roughout and a barely used example (Accession no. 1945.381A; Illus 156c) through to examples which are so extensively worn they may not have been functional at the time of discard (Illus 156d).

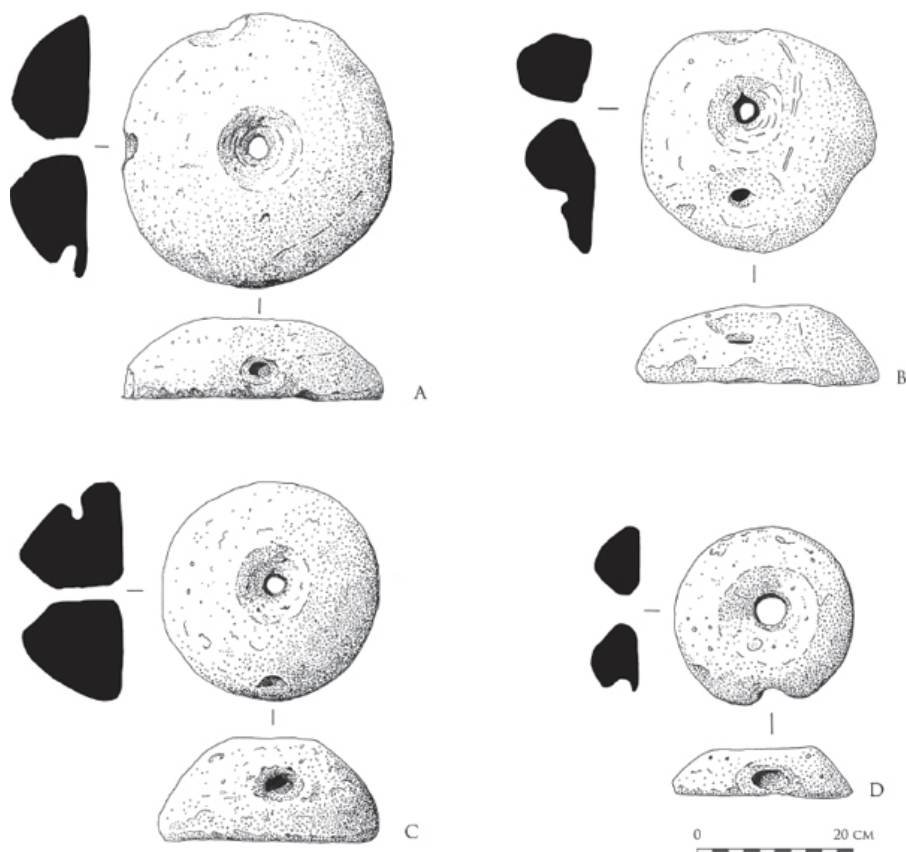


Illus 155. Worn beehive quern (Stranraer museum; Accession No. TN462). Illustration by John Pickin

In contrast to the antiquarian finds, the rotary stones recovered

during excavation are predominantly fragmentary. Surviving portions range from 50% of the stone, as at Cults Loch 5, through to tiny fractured edge fragments such as that from Fox Plantation where less than 5% of the stone remains ([Illus 157](#)). These fragmentary pieces from Fox Plantation (unpubl; examined at Stranraer Museum) and another highly fractured piece from Luce Sands within the collection of Ludovic Mann at Glasgow Museums, all have vertical as opposed to horizontal handle sockets and are likely to derive from the rounded edges of disc-shaped rotary stones.

These fragmentary stones are likely to have been deliberately broken up prior to deposition. Although no broad study of the fragmentation of Iron Age quernstones has yet been conducted in Scotland, as it has for Yorkshire ([Heslop 2008](#)), the fractured condition and evidence for reworking or non-accidental damage is a recurring feature noted across northern Britain (see [Chap 4](#) for discussion of fracturing patterns).



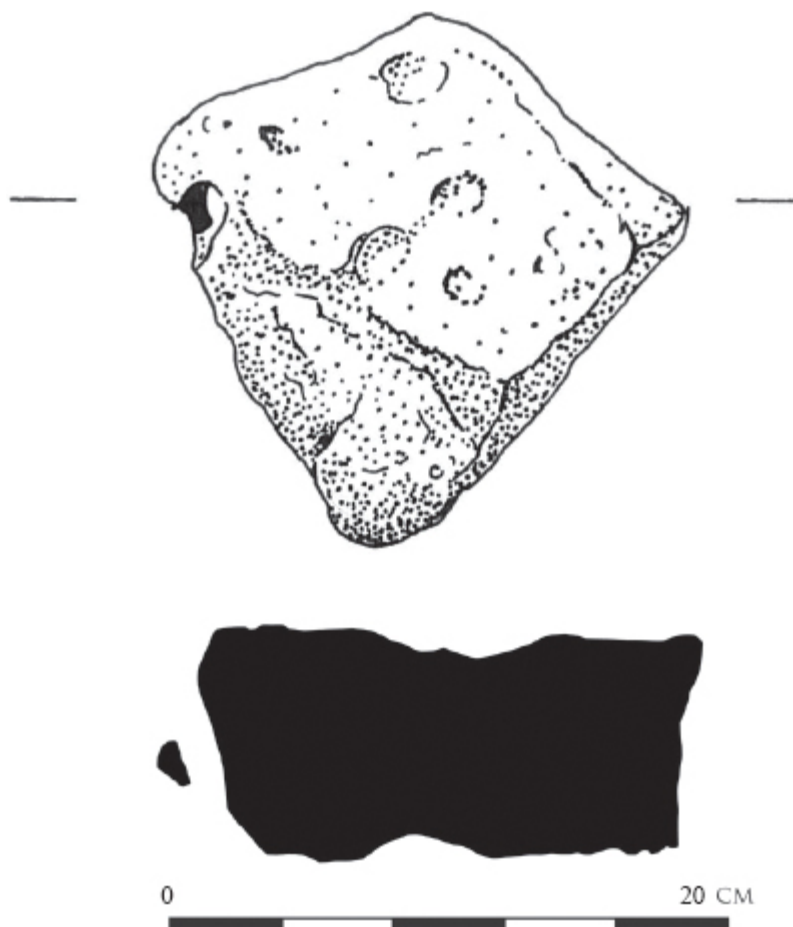
Illus 156. Wigtownshire quernstones: a, Bun-shaped querns with horizontal handle socket; b, Bun-shaped quern with vertical handle socket; c, Lightly used bun-shaped quern; d, extensively used bun-shaped quern (Stranraer museum: Accession No. 1949.379a; 1945.380; 1945.381a; TN 464).

The surviving upper portion of the upper stone of a granite beehive quern from Barlockhart (NMS: X.BB 75; [illus 154b](#)) provides a parallel for the deliberate destruction of the Cults Loch 5 quern (SF 8). Only 75% of the circumference of the stone remains; a small wedge-shaped segment of the quern and the grinding surface has been deliberately detached. The surviving portion represents the uppermost surface of the stone only; the top has been deliberately split off, essentially ‘decapitating’ the stone. This can be mirrored in examples from Yorkshire (Heslop 2008, 69–72). The motivation behind this recurring pattern of fragmentation is not readily explicable. Heslop questions whether this pattern of breakage can simply be seen as an attempt to render the artefact inert; to effectively ‘kill’ the object (2008, 71). Instead, he discusses the possibility that the division of the quern could be considered under the same rationality as the division of the body into fragments so that the power of the object can be shared and retained beyond the use of the object as a grain processing tool (*ibid* 71).

The frequent evidence for purposeful destruction of Iron Age quernstones strengthens the view that querns were valued objects, requiring special treatment prior to deposition (*ibid* 70) and may also be seen as symbols for agricultural fertility (Hingley 1992); objects which may have been seen as having lifecycles similar to that of their owners (Brück 2001, 152). Hingley argues that quernstones are just one type of object connected to the agricultural cycle which appear to have been deposited in significant contexts during the Scottish Iron Age (1992, 32).

One final point to be teased out of this review of the rotary querns from Wigtownshire is the divergent patterns between examples in antiquarian collections and those from excavated assemblages. What we seem to be observing are two significantly distinct, almost opposing patterns, the implications of which are wide-ranging and important to broader issues of on-site depositional practices and the representational value of antiquarian collections. Within the Wigtownshire antiquarian collections we see mostly intact bun-shaped querns with horizontal handle sockets but those from excavations are quite different: the range of quern types is wider (bun-, beehive and disc-querns) and the vast majority of examples are fragmentary, representing between 5% and 50% of the original circumference of the stone. The high incidence of fragmentary stones from excavations (a notable exception being a bun-shaped upper stone from Teroy broch; Curle 1912) adds weight to the argument of deliberate

fragmentation of rotary quernstones in antiquity prior to discard or purposeful deposition. This dichotomy in the composition of quern groups between antiquarian collections and excavated sites also suggests that although the breaking up of rotary stones during the Iron Age appears to have been a fairly typical practice, the general lack of incomplete examples within antiquarian artefact assemblages represents a significant gap in our records due to a lack of recognition or interest on the part of early collectors. This question over how current and past artefactual collecting policies contribute to and limit our understanding of the past is unlikely to be unique and emphasizes the importance of examining artefacts from both antiquarian collections and excavated assemblages together, as both provide only fragments of a bigger, more complex picture of past practices.



Illus 157. Fragment of disc-quern from Fox Plantation (SF 'F'). Illustration by John Pickin. Scale

Cobble tools

Cobble tools are a heterogeneous group of stone tools which have a long currency in Scotland from the Mesolithic to medieval periods and are common finds on Iron Age sites. These tools are typically formed on water-rounded pebbles and cobbles without any preparation or shaping of the stone prior to use.

The term 'hammerstone' has long been used as a short-hand description for such tools (Evans 1872) but this masks subtleties in use indicated by a range of surviving wear patterns, and limits the potential for intersite comparison based on published accounts. Although following the accepted terminology of 'hammerstone', Maxwell's early consideration of cobble tools recognised that differences in surviving use-wear probably indicated subtle differences in their function, referring to them variously as 'hammerstones', 'bruisers and pounders' (1889, 214–216, fig 19 and 20).

Cobble tool use-wear may be classified into broad groups adopting the methodology used by Ballin Smith in the classification of the assemblage from the Howe, Orkney (Ballin Smith 1994, 196–202). Such classification systems still have their limitations as they do not necessarily define the function of the tool, but such schemes can usefully categorise the wear traces which in turn allows avenues into the issue of use. Re-examination of Wigtownshire cobble tools has shown that a much wider range of wear is present than previously recognised.

When considered as a broad homogenous tool type cobble tools are thought to be chronologically indistinct. Yet recent regional studies have demonstrated the existence of more refined chronological patterning in the use of particular objects during the Iron Age. For example, whetstones tend to be more prolific on Late/ Roman Iron Age sites while circumferential pounders/ grinders appear to see a floruit of use during the Late Bronze Age/Early Iron Age (Hunter 2009a, 148; McLaren & Hunter 2007). Nevertheless, cobble tools found as stray finds are problematic to date with any certainty, limiting the inferences that can be made about many antiquarian finds. As such the following discussion will focus almost exclusively on finds recovered from Iron Age sites rather than stray finds or early collections.

Over 75% of the site assemblages from Wigtownshire with items of worked stone include at least one cobble tool. These display a range of possible functions such as pounders, grinders, hammerstones, whetstones, smoothers and polishers; many were previously identified only as 'hammerstones'. Only at Airyolland, Cults Loch 5, Teroy and

Whitecrook Quarry were cobble tools absent where other items of worked stone survived.

The cobble tool assemblages from Wigtownshire are really too small for reliable patterns to be teased out but a few trends can be noted. Pounding and grinding tools are the most common type in excavated assemblages (eg Airrieolland Crannog and Fox Plantation; Munro 1882, 112–115, *GUARD*, unpublished). These tools are likely to have been used in a range of tasks such as crushing grains or other foodstuffs, preparing clay for potting or even crushing minerals for use as a pigment. Smoothing stones (following the definition of Lane & Campbell 2000, 178, 179, 185), are probably hide-processing tools. These tools are undoubtedly under-represented in assemblages from early investigations due to their ephemeral wear traces which are sometimes little more than a smoothed facet on one face and/or patches of red-brown staining. A small number have now been identified amongst the collections from Airrieolland, Barhapple, Cults Loch 3 and Machermore (Munro 1882, 114, 185; McLaren [Chapter 2d](#) *infra*; Wilson 1878, 17–18).

Whetstones, while not abundant, are amongst the most common tool type from excavated sites, particularly crannogs, with examples from Airrieolland, Barhapple, Cults Loch 3, Dowalton Loch and the open settlement at Fox Plantation. A sharpening stone is also known from Rispaig (Haggarty & Haggarty 1983, 44, no 1). These are a useful indicator of the presence and use of metal blades which rarely survive. Two broad categories of whetstone are present: those formed on elongated ovoid or bar-shaped water-worn cobbles, unmodified prior to use, and those whose surfaces have been extensively modified and shaped before working. The latter category, which includes examples from Dowalton Loch (Munro 1882, 41) and Knockneen (Anon 1892, 50; NMS: X.AL 6), also appear to utilise particularly fine-grained attractive stones, implying careful selection of the rock type used. This may hint at the importation of stones or finished objects from areas outwith the immediate locale but without detailed lithological analysis this remains speculative. A study in East Lothian found that whetstones were more prolific on Later/Roman Iron Age sites than during earlier periods, presumably reflecting greater access to iron blades (Hunter 2009a, 148). Sites in Wigtownshire where greater numbers of whetstones were found, such as Dowalton Loch crannog, have also revealed diagnostic Roman Iron Age artefacts (Munro 1882, 43–50, fig 13, 20–24), bolstering the pattern of use and deposition suggested for East Lothian.

Most of the cobbles recovered from Iron Age sites in the region are

single-function tools but a small number of combination or multifunction tools are also present. Many exhibit signs of considerable wear in the form of welldeveloped, often multiple facets, worn to such an extent that the shape of the stone itself has been significantly modified and in some instances much of the original surface of the stone has been removed by use. Small numbers of lighter-use tools are also present, suggesting expedient, possibly single use and rapid discard. More lightly-worn cobble tools or those with more ephemeral wear traces were notably underrepresented amongst the antiquarian collections.

Combination tools, where different wear from two or more distinct types of use are observed on the same stone (eg abrasion from grinding and smoothing and staining from use as a hide-processing tool) are common in cobble tool assemblages elsewhere and this is reflected in the Wigtownshire stone groups (eg an example from Machermore NMS: X. AK 100; [Illus 158a](#)). 50% of the site assemblages with cobble tools include at least one combination tool. Why some sites, such as Rispain and Carghidown only include small quantities of singlefunction cobble tools and others, such as Cults Loch 3, have numerous examples is unclear. This may be related to the availability of raw material for use as tools but is likely to also be related to the structural evidence of more prolonged occupation and activity.

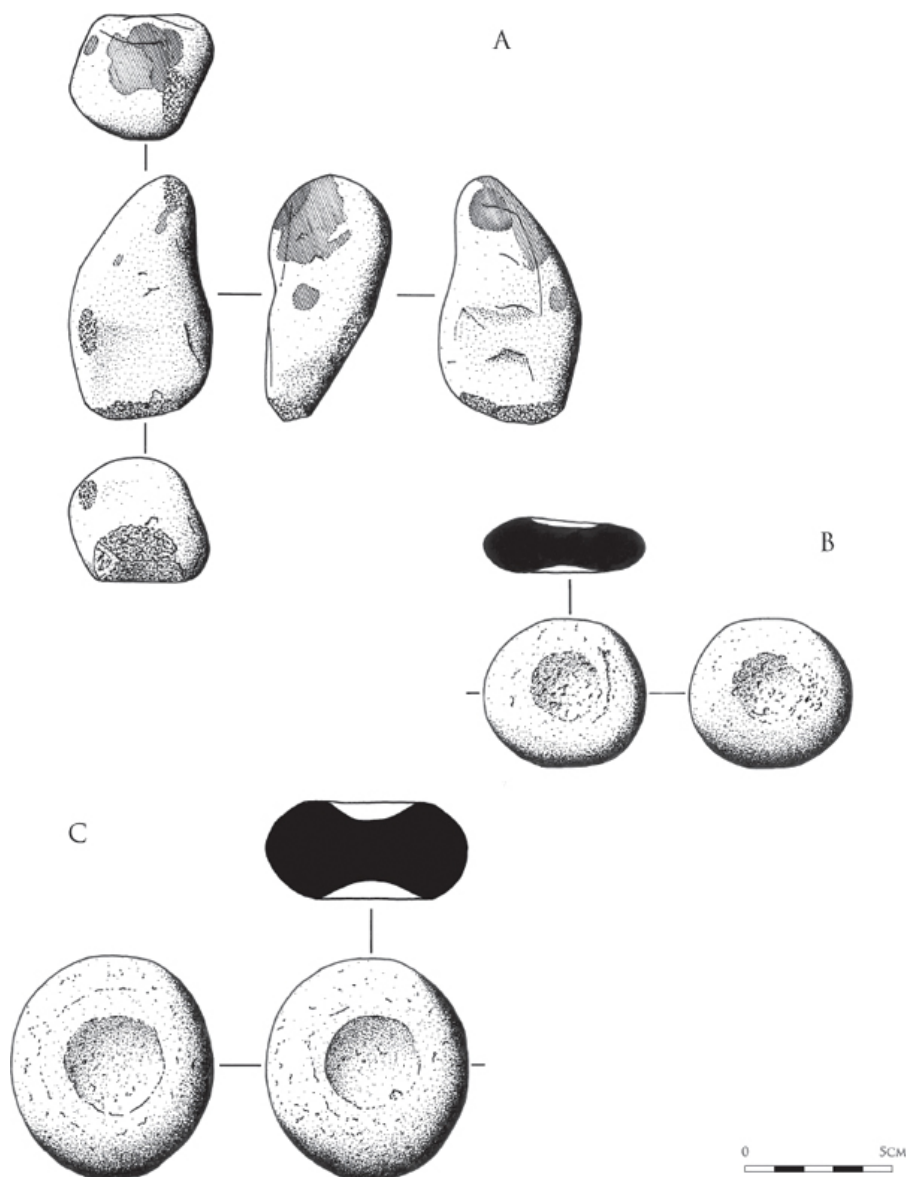
No distinct patterning in the combinations of use-wear on combination tools could be determined either on an inter-site or infra-site basis due to the small number of tools involved, but abrasion and pounding, abrasion and smoothing, and pounding and hammering were repeated combinations. In addition, many cobble tools saw final use as hammerstones. Hammerstones are defined here as stones which have been brought down hard with heavy physical force on another material resulting in fracture damage, spalling and flaking of the surface of the stone at the point of impact. In these combination tools, this fracture damage cuts through and removes portions of the use-wear created by previous use; in many cases the damage is so severe that the stone no longer appears to be suitable for further use. A similar pattern of use has been noted in other areas (Hunter 2009a, 148). A question remains over whether such damage was the result of the final phase of practical use of the stone, or whether this damage represents deliberate mutilation of the tool to put it out of use (*ibid* 148).

Recent lithological analysis of coarse stone tools demonstrates that most of the stones used in the production of cobble tools from Wigtownshire are likely to have been sourced locally, utilising

available raw materials such as greywacke (lithic arenite), diorites and intrusive granites, shale and sandstone as well as taking advantage of glacial erratic cobbles of quartzite. But at Cults Loch 3, usewear analysis has demonstrated that the cobbles used were carefully selected based on size, shape, texture and weight for specific tasks, as is suggested by the cobble tool assemblage at Braehead, Ayrshire (McLaren & Hunter 2007, 224). A similar pattern is hinted at in the cobble tool assemblage from Fox Plantation, although lithological work in conjunction with use-wear analysis has yet to be undertaken here.

A more unusual form of cobble tools are a group classified as indented stones or hollowed stones ([Illus 158b](#) & [c](#)). An extensive collection from Wigtownshire, all stray finds, was donated in the late 19th century by Maxwell and Wilson. These objects were defined in the Museum of Antiquities of Scotland's 1892 catalogue as 'water-worn pebbles of an ovoid form, but flattened on two sides, the indented hollows being usually formed in the centre of the flattened sides. These hollows are generally circular in plan and conical in section' (Anon 1892, 53). They are an interesting but enigmatic group. Maxwell (1889, 211) remarks that the 'use for which they were intended is extremely obscure'. Wilson (1880, 127–9) suggested they were notably common in Wigtownshire, arguing that many were hammerstones, the hollows providing a better hold for the fingers and thumb (Anon 1892, 53), but this seems unlikely in most cases. Reassessment demonstrates that they comprise a much more heterogeneous group than originally understood: some are hollowed on one side only, whilst others have been worked on both faces; some have been shaped prior to use, others use naturally rounded water-worn cobbles; the interior of the hollows is often smooth as if rubbed or bored, others are gently pecked, whilst further examples are deeply gouged and pitted. This classification of masks a diverse range of wear. Some, such as an example from Balcraig (NMS: X.AK 152) with multiple irregular patches of deep peckmarks, gouges and dents are likely to be anvil stones used in conjunction with flint knapping. The small discrete but deep smooth hollows on both faces of a cobble from Glasserton (NMS: X.AM 37) are indicative of a different function, probably a drill-cap or digging-stick pad. An example from Machermore ([Illus 158a](#)) displays combinations of wear: the shallow hollows on the centre of each face have been pecked and then smoothed through use, whilst the rounded surfaces of the stone display a notable polish and dark-stained residue suggesting possible use as a smoother for hide-processing activities (NMS: X.AM 14;

Maxwell 1889, 211, fig 11; Wilson 1880, 128). Multifunctional wear is also indicated on an example from Kilchrist, Penninghame where both faces of the cobble appear to have been abraded and smoothed prior to a deep circular round-based hollow being sunk into the centre of the faces (NMS: X.AM 41; [Illus 158c](#)). As so many of these objects have been recognised only as stray finds, defining their date remains problematic and this is compounded when we consider the range of functions that these tools undoubtedly represent. Parallels have been found in association with Mesolithic sites, such as that from Sand Rock Shelter, Applecross, Highland (Clarke 2007, illus 469, 470 & 471), and this may offer a guide to date. Yet the example from Machermore was recorded by Maxwell (1889, 211) and Wilson (1880, 128) as being found by a child ‘among the shingle when the water was low, close to a small crannog in Machermore Loch, Old Luce’, indicating that the use of these items may well have continued into the later prehistoric period in Wigtownshire.



Illus 158. a. Multifunction cobble tool from Machermore (NMS: X.AK 100); b) indented cobble from Stoneykirk (NMS: X.AM 25); c. indented cobble from Kirkchrist (NMS: X.AM 41). Illustration by Alan Braby

Decorated stones

Decoration of stone objects during later prehistory is fairly rare and appears to be restricted to a select group of artefact types, such as upper rotary quernstones and spindle whorls (McLaren & Hunter 2008, 117–119). Only one stone item from Wigtownshire (excluding poorly-dated whorls) is unquestionably decorated. This consists of an

upper disc-shaped quernstone with a large central feeder pipe surrounded by an incised equal-armed cross which was found as a stray find in the late 19th century in Stranraer (*PSAS* 13 (1878–9): 172; Anon 1892: 75; NMS: BB 6). Recent consideration of decoration on rotary querns in Scotland by two of the authors (McLaren & Hunter 2008) has demonstrated their rarity. Based on a large scale study of the features and contexts of decorated rotary quernstones, the Stranraer quern conforms to type 2bii (McLaren & Hunter 2008, 113, 117, [illus 3, 4b](#)) where the decoration splits the upper surface into quadrants with a vertical handle socket, at the terminal of two opposing ‘arms’ of the incised decoration. Only four similarly decorated querns are known from Scotland (*ibid* [appendix 1](#)) and these display a clear concentration in the southwest with a single outlier in Benbecula. Limited contextual information suggests a Roman Iron Age date.

Also worthy of note, but not strictly part of this particular study due to questions over the exact provenance of the find, is a large disc-shaped rotary quern in the Selby Collection at Stranraer Museum. This upper quernstone is approximately 450 mm in diameter and is decorated with a raised collar which encircles a wide deep central hopper expanding outwards towards the edge of the stone to flank a U-shaped horizontal handle slot on the upper face. This quern was included in a recent study of horizontal slot handled querns and conforms to decoration type 1c (McLaren & Hunter 2008, [table 2](#), no 35). Stratigraphically secure examples of querns of this type from elsewhere in Scotland indicate Roman Iron Age floruit of use (*ibid* 114).

Stone working

Despite the frequency of stone tools from later prehistoric sites evidence for stone working is rare. Cut-marked stone slab fragments from Carghidown (sf 4225.14; Engl 2007, 290) and Rispain (Haggarty & Haggarty 1983, 44, fig 13:1) are known, consisting of incomplete robust sandstone slabs with series of diagonal linear cut marks running transversely across the faces. Both examples were wellstratified; the Carghidown example derives from the earth and rubble bank of the Phase 1 ring-groove of 2nd century BC to 1st century AD date, and the Rispain stone from the fill of a posthole in the interior of the Iron Age enclosure. Re-examination of these tool marks suggests that they had been made with a metal chisel blade (*contra* Engl 2007, 290). The curvilinear alignment of the tool

markings on the Carghidown example appears to be the beginnings of an attempt to split the stone. The configuration of individual tool markings on the Rispain stone is more irregular and less readily explainable. It is unclear in both instances what the intended product was, but they represent clear evidence of on-site stone working, an expected but rarely demonstrable craft (McLaren & Hunter 2008, 107). This complements the evidence for stone working at Cults Loch 3 in the form of a re-worked saddle quern (SF 10/10).

Also from Rispain is a small thick stone disc which has been ground to shape (Haggarty & Haggarty 1983, 45, fig 12:4). A small shallow pit at the centre of one face could indicate an intention to perforate the object for use as a weight or whorl; alternatively, it could have been a gaming piece, as suggested by the excavators (*ibid* 45). A similar unfinished spindle whorl comes from Airyolland dun (Cavers & Geddes 2010).

Other worked stone

In addition to the tools already mentioned, two sites produced perforated stones that are likely to have used as weights, functioning as loom weights, net-sinkers or thatch-weights. Three weights came from Machermore (Munro 1882, 52), one has evidence of secondary or more complex use in the form of staining and polishing that may be from handling (NMS: X.AO 82) and a further example from Rispain (Haggarty & Haggarty 1983, 45). Although the provenance and date is not assured, other examples from Carleton, Glasserton, Luce Sands and the area around Airrieoland are known (Wilson 2001, 115; Murray 2005) and a variety of perforated stones are frequently encountered amongst antiquarian collections.

A small number of bipartite mauls, used for heavy-duty hammering or crushing, are known. Two are antiquarian finds from Balcraig (NMS: X.AK 161) and Kirklauchline (NMS: X.AK 133) and cannot be closely dated, but a third example, associated with the hillfort at Barhullion (Maxwell 1885, 53) may have a later prehistoric provenance. Tools of this type are not commonly encountered in prehistoric assemblages which could suggest a specialist function beyond an obvious use as a hammerstone/heavy-duty pounder or weight. It is likely that they are related to the extraction of minerals or ores for metalworking (Hunter et al 2006, 50, fig 1). While evidence of Iron Age mining in Scotland remains elusive, potential prehistoric exploitation of the historical copper mine at Tonderghie has been postulated (Pickin & Hunter 2008). The proximity of the Balcraig,

Kirkclaughline and Barhullion mauls to this potential prehistoric mine is of interest and highlights the need for further work to explore the possible early exploitation of the Tonderghie and other potential mineral sources in the south-west.

A few worked stone items might be classed as personal objects or jewellery. A thin, flat, sub-square plate of polished stone from a crannog at Dowalton Loch (Maxwell 1889, 217, fig 23) has been very carefully shaped and finished, being finely ground and polished across all four edges and both faces. No obvious wear traces from use are present, but it was probably used as a small palette for grinding pigments or other special substances. A similar disc is reported to have been found at Barlockhart Loch; its whereabouts are now unknown but it may have been a small disc-shaped palette (Wilson 1876, 584). A polished stone disc produced from a slab of quartz (Anon 1892, 68; NMS: X.AV 9) is unprovenanced but is likely to be from Wigtownshire. Similar disc-shaped palettes come from Lochspouts Crannog, Ayrshire (Munro 1882; Anon 1892, 256; NMS: X.HW 4).

Items of jewellery are rare, apart from black stone jewellery (discussed elsewhere), but small stone ring from Barlockhart Loch (Munro 1882, 56, fig 28), ground to shape, was probably a ring-pendant, a well-known Iron Age type.

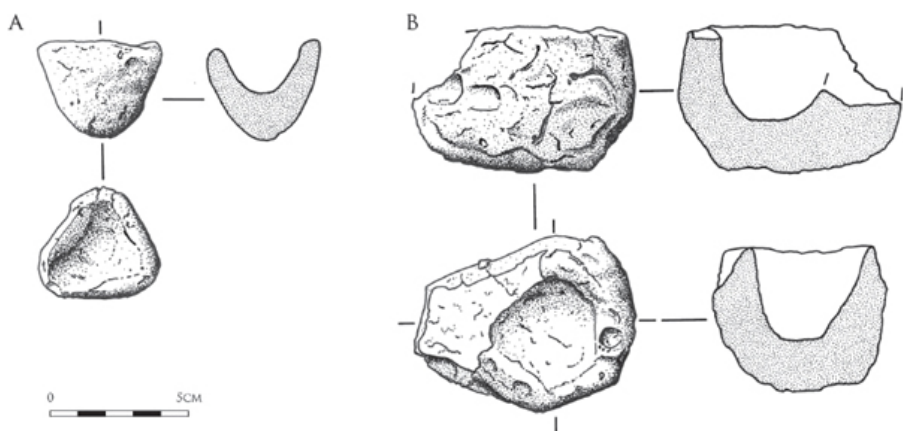
Large numbers of spindle whorls are known from Wigtownshire, but almost all are stray finds which cannot be closely dated. Interestingly, there is an almost total lack of spindle whorls amongst the modern excavated assemblages. The exceptions are an unfinished example from Airyolland dun and a further possible roughout from Rispain. In all other instances where whorls were recorded from known sites, such as two whorls from Barhapple Crannog (Munro 1882, 182–190), their stratigraphic relationship to the structural evidence recorded is unclear and a question remains over the Iron Age date for deposition. Does this suggest that textile working was not undertaken during the Iron Age in Wigtownshire? This seems unlikely: the small number of stratified finds from excavated settlement sites and large numbers found as stray finds suggests that the task of spinning wool into yarn was not generally undertaken in-doors in a domestic context, but out in the fields perhaps during breaks in agricultural activities.

Struck lithics

Struck lithics are a rare but notable presence on a small number of Wigtownshire sites. Struck flint and quartz have not been included in the tallies and tables of Iron Age finds noted here, as in most instances

they are interpreted as representing earlier Neolithic or Bronze Age activity (eg Aird Quarry), residual earlier material (eg Dorman's Island) or undatable unstratified material (eg Buiston, Ayrshire). Cults Loch 3 is an exception as 35 items of worked flint, chert, quartz and quartzite are present, the majority deriving from well-stratified contexts which relate to the occupation and use of the various timber structures. The lithics are restricted to a small number of tools, including an awl (SF 12), two side-scrapers (SF 21 & 28), other expedient tools and debitage. Rather than being residual earlier material incorporated within a later structure, these appear to represent Iron Age tools contemporary with the structures. The presence of debitage is significant as it implies on-site working. This complements the picture at Airrieolland crannog where a small quantity and limited range of struck lithics were also recovered (Maxwell 1885).

The extent and duration of use of struck lithic technology in the Iron Age has been a subject of much debate (Saville 1981; Humphrey & Young 1999; Ballin 2009, 33–38), but an increasing number of recently excavated sites in Scotland, such as Gob Eirer, Uig, Lewis and Burland, Shetland are providing convincing evidence of the persistence of lithic technology into the Early Iron Age, albeit on a fairly expedient basis (Ballin 2011, 52–55; Ballin 2009, 33–38). The assemblage of struck quartz from the Late Bronze Age/ Early Iron Age site at Gob Eirer is particularly significant as it is complemented by anvil stones and hammerstones used in the manufacture of quartz tools found on site (McLaren 2011). The presence of struck lithics at both Cults Loch 3 and Airrieolland crannog contributes to the emerging picture of later prehistoric flint and quartz use in northern Britain and highlights the need to carefully assess the stratigraphic security and significance of any lithic finds on later prehistoric excavated sites.



Illus 159. a. crucible from Luce Sands (NMS: X.BHA 349), b. Heavily vitrified crucible from Dowalton (NMS: X.HA 36). Illustration by Alan Braby.

Iron and ironworking

Iron artefacts and ironworking debris are rare, being found on only seven sites. Iron does not tend to be collected as a stray find and is rarely chronologically distinct enough to be attributed to the Iron Age without a securely dated context, meaning iron objects and working debris from multi-period unstratified sites like Luce Sands could not be included in this study.

Five of the seven sites unfortunately tell us little as the material either cannot be securely dated to the Iron Age or is now lost and cannot be identified. Black Loch of Myrton crannog produced ‘masses of corroded iron and vitreous slag’ and Airrieolland crannog produced ‘slag’, both of which are now lost and cannot be certainly identified as ironworking slag. Two axe heads, a hammer head, two vessel handles and a smithing hearth bottom were recovered from a crannog in Dowalton Loch (Munro 1882, 47, figs 17–19) and an iron knife handle from Loch Inch-Cryndil crannog (Dalrymple 1872, 391), while unidentified iron fragments from the excavation of Teroy broch (Curle 1912, 87–88) are now lost.

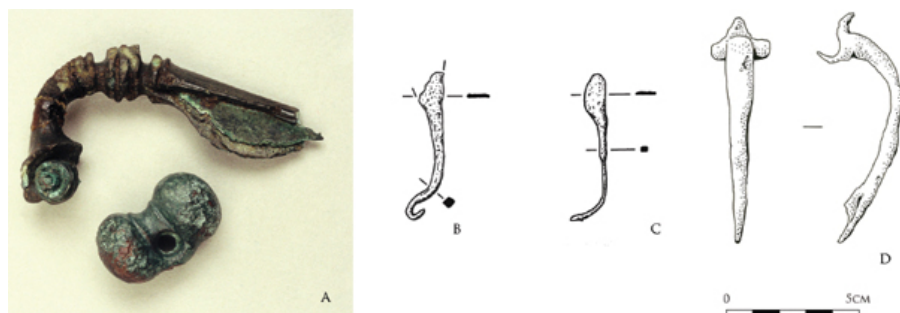
The two remaining sites have produced the only secure evidence of iron production and use within the study period. The enclosure at Rispaan Camp produced a large pair of tongs, likely to be a votive deposit, from a ditch radiocarbon-dated to the 2nd/1st centuries BC, while earlier work produced an iron adze (Haggarty & Haggarty 1983, 40, 49 and fig 13). The High Torrs burial contained Torrs burial contained an intaglio ring, dish fragments, nails, an L-binding and unidentifiable fragments. A fragment of slag recovered from the site has a composition similar to iron smelting slag (Breeze & Ritchie 1980, 80). The burial is thought to be Roman but, as discussed above,

could equally be a rich Iron Age example.

Such a sparse amount of evidence for iron manufacturing suggests that, as with non-ferrous metalworking (discussed below) the craft was a restricted one. Most of the iron objects which have survived are in special contexts; votive, burial or waterlogged, whereas much of the iron in use in Iron Age Wigtownshire may not have survived, whether recycled in prehistory or corroded over time.

Copper alloys and their manufacture

Evidence for copper alloy working is equally sparse, with crucibles noted from only four sites. A pear-shaped heavily vitrified example from Dowalton finds Iron Age parallels (eg Hedges 1987, fig 1.47; [Illus 159a](#)), while the undiagnostic fragment reported from Whitecrook is from a LBA/EIA site. Triangular crucibles found at Luce Sands (one example; [Illus 159b](#)) and Airrieolland crannog are a more typical later Iron Age type which continued for much of the 1st millennium AD. Airrieolland produced evidence of more prolonged metalworking, with sherds from three different crucibles, two of which had been relined to extend their use-lives. The quantity from Luce Sands is small, with sherds from only three crucibles located in this study (the Mann collection is said to have 'several fragments' which cannot be traced); one comes from the High Torrs burial, but given the circumstances of its recovery, one would hesitate to suggest this sherd was a token grave good rather than a conflation of materials from the surroundings. The sparsity of crucibles from the Sands is significant given the wealth of material otherwise.



Illus 160. a. A bronze trumpet brooch and dumb-bell toggle from Luce Sands (NMS: X.BHF 5–6). © Trustees of the National Museums of Scotland; b) and c) one-piece Iron Age brooches from Luce Sands (NMS: X.BHF 4 & X.BH 9104), illustration by Alan Braby; d) Colchester-type one-piece brooch, possibly from Luce Sands (Stranraer museum: 1945.205), illustration by John Pickin.

The rarity of finds suggests this was a genuinely restricted craft skill. Yet there are signs that Wigtownshire had access to and exploited its local metal resources. Non-ferrous metals, especially

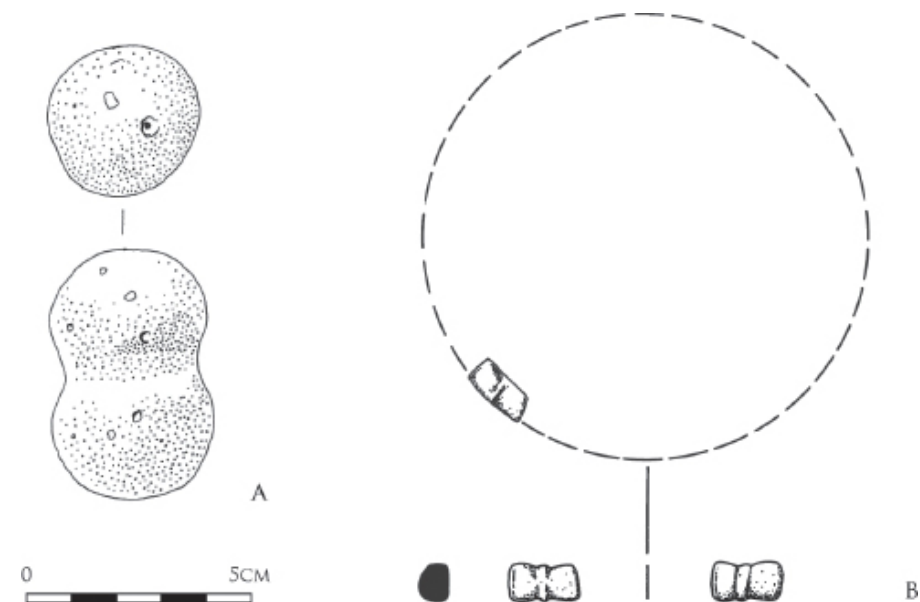
copper and lead, are found both in the intrusive igneous rocks of the Galloway Hills in Kirkcudbrightshire and on the coast of the Machars, notably at Tonderghie, near Whithorn (Wilson 1921, 44–58, 123–9, fig 6). Here an abortive post-Medieval mine is recorded, but circumstantial evidence suggests that this copper source was exploited in prehistory as well. It would have been highly visible from the sea as a green stripe on the rock, and the exposed seam has been totally worked out. Finds from the area hint at its use since the early Bronze Age, with antiquarian records of axe-ingots, ‘masses’ of copper, and an Iron Age or Roman plano-convex ingot from nearby Carleton (Hunter 2007, 285–288). This latter is particularly intriguing: recent analysis at NMS (by Dr S Kirk) has confirmed earlier indications that it is a copper ingot with a notable quantity of lead (around 5%), but *contra* earlier results it does not contain any tin (Whittick & Smythe 1937); other elements (Sb, Ag, Zn) are at levels which could readily derive from the ore. The lead levels may represent deliberate alloying, but could also stem from a source rich in both copper and lead. Circumstantial support for this comes from the unique lead beads recovered from the Iron Age promontory fort at Carghidown, only 500 m from the mine (Toolis 2007, [illus 19](#)). It suggests exploitation of local metal resources in the Iron Age, and perhaps earlier. Lead is also represented by a small piece of galena from the Barhapple crannog. This may represent a talisman, gathered as an unusual or powerful stone, but could also be a hint of exploitation of the material; it certainly hints at knowledge of local geology.

Decoration and adornment

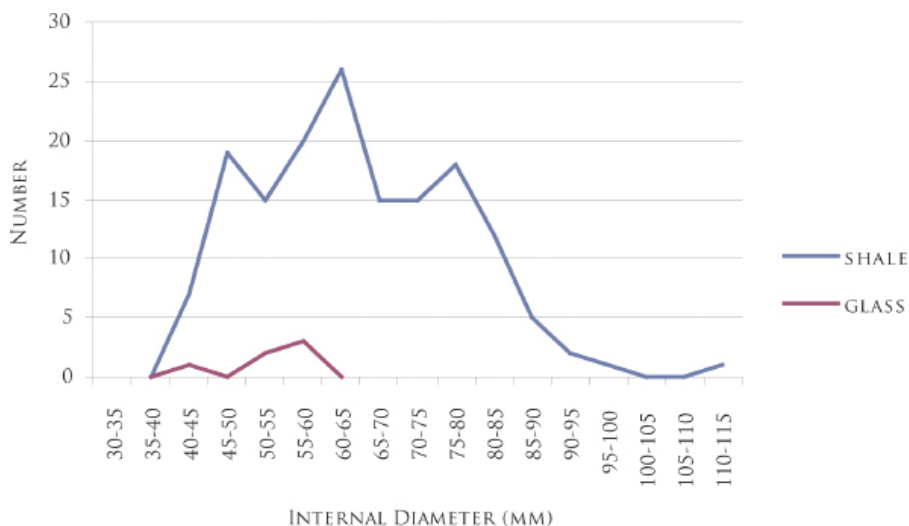
The copper alloys themselves are a restricted but interesting range. They include a range of Roman finds, discussed below, and a series of fittings (such as mounts and rings) which point to lost organic objects. More diagnostic are some personal ornaments: a dumb-bell toggle from Luce Sands and, most notably, six late Iron Age brooches from the same area ([Illus 160a](#)). The concentration here is remarkable given the rarity of brooches otherwise in Iron Age Scotland. An earlier survey (Hunter 2009b) did not cover the latest Iron Age types, but inclusion of these shows a remarkable cluster in the area of simple one-piece late La Tène types of late 1st century BC to early 1st century AD date ([Illus 160b & c](#)). One finds parallels in SW England (Hull & Hawkes 1987, 193, 196; Hattatt 1985, 14–15), while there are two of the *Drahtfibel* type, made in one piece with a rod bow (one lacks the head, so the classification is less secure). Such simple wire brooches are otherwise exceedingly rare in Scotland (Hunter 2009b, [table 1](#)

caption), as is the Colchester-type one-piece brooch from the Anderson collection, most likely from Luce Sands (the type was current c AD 1–60; [illus 160d](#)). Slightly earlier activity is represented by a Nauheim variant, perhaps an Irish type of late 2nd/early 1st century BC date, and an involuted brooch of the 2nd century BC (Hunter 2009b, 149–150). Brooches are notably rare in Iron Age Scotland, and the quantity from Luce Sands suggests this area at the head of a dominant bay was a focal point for contacts (see below).

Other forms of metal personal adornment are notably rare: given the size of the Luce Sands assemblage, it is tempting to see these gaps as significant. There are none of the Iron Age ‘type-fossils’ of projecting ring-headed pins or spiral finger rings, and distribution maps indicate these types were simply not used in SW Scotland (Clarke 1971, fig 3 and 4; although these maps are now out-dated, there are no additions to the single spiral finger ring from Castlehaven (Borgue)). There is a notable sparsity of decorative metalwork in general, and a recent upsurge in metal-detecting has not changed the picture. Celtic art is virtually unknown west of the river Cree (Garrow & Gosden 2012, fig 3.2); decorated mounts from Dowalton and Airrieolland and an enamelled fitting from Rispain are the only examples (MacGregor 1976, nos 173, 253, 335; Haggarty & Haggarty 1983, fig 13 no 7). This suggests different approaches to expressing identity and affiliations in different parts of SW Scotland: Kirkcudbrightshire and Dumfriesshire share rather more of the boss- or trumpet-decorated styles typical of central Britain, while Wigtownshire and Ayrshire seem more Atlantic in their outlook, with a lack of decorative metalwork (a point-Cavers (2008) has discussed in terms of architectural influences). The differences are not absolute, of course: ring-headed pins and spiral finger rings are found in the wider Atlantic zone, but not in Galloway, while local differences are seen in material such as the quantity of brooches. However, this does indicate regional variation and different patterns of affiliation.



Illus 161. a. glass dumb-bell toggle (Stranraer museum: 1964.49), illustration by John Pickin; b. dumb-bell toggle reworked from piece of glass bangle (NMS: X.BHB 16), illustration by Alan Braby



Illus 162. Relative diameters of glass and shale bangles

Copper alloy ornaments may be lacking, but the picture is very different with glass. Beads and bangles are well represented, with bangles on five sites (and one stray find), Iron Age beads on five (plus a stray), and Roman melon beads represented by four sites and four strays. There is one site and one stray find of a dumb-bell toggle ([Illus 161a & b](#)). The bangles are representative of a wider central British tradition; here Wigtownshire was participating in wider decorative trends. Compared to the shale/cannel bangles ([Illus 162](#)), their small

internal diameters are likely to be child and female ornaments. A wide range of types is represented (Table 22), with a number showing evidence of repair, reuse and longevity: for instance, a type 1 fragment was reused as an amulet in an early Medieval grave from Barhobble, while a type 2 bangle was reworked into a dumb-bell toggle from Luce Sands (Illus 161b). Purpose-made toggles of this form are also found, and attested locally in copper alloy and shale as well.

Table 22. Glass jewellery (excluding Roman items)

Site	Bangle	Bead	Dumb-bell toggle	Notes/reference
Luce Sands	3 (types 2 (reused), 3A, 3A (repaired))	Yellow annular (class 8) Yellow globular Blue annular & cylindrical (group 6 (iv) & 7 (iv)) Opaque red Class 10 (Meare spiral) Class 13	4 (1 a reused type 2 bangle)	Guido 1978, 161, 172, 182, 189
Barhobble	Type 1	–	–	In early Medieval grave
Dowalton	4 (types 2; 3A, 3A, 3B)	Class 14. Odd composite bead (glass over CuA cylinder & clay core)	–	Guido 1978, 200
Airrieolland crannog	–	Opaque red annular	–	Guido 1978, 180
Whithorn	4 (types 1, 2, 3A, 3A)	–	–	Price 1997
Dorman's Island	2 (types 3G, 3J)	–	–	1 reused, 1 repaired
Castle Loch	–	Globular, with spiral-inlaid eyes Blue annular (class 6 (iv))	–	Stevenson 1976, fig 1 no 5; Guido 1978, 161
Rispaan	–	–	–	2 blue glass/enamel frags (lost)
Black Loch	Type 2	–	–	
Loch Inch	–	Class 5a	–	
Cults Loch 3	–	Class 7a	–	
Kirkmaiden	–	–	–	Guido 1978, 118, fig 15 right; Henderson (1991, fig 4) implies he saw a class 8 from this area, but this has not been traced
Stair collection	–	–	1	Stranraer 1964.49
Portankill	Type 2	–	–	
Wigtownshire	–	Class 14 variant	–	Guido 1978, 200

Bangle types follow Kilbride-Jones (1938), bead types Guido (1978). Only references additional to the site-specific ones in the appendix are given

The range of beads is particularly interesting and varied. The overall range from the area is wider still, as there are a considerable number of more ornate beads which are likely to be early Medieval. However, focusing on the most securely Iron Age ones reveals a range which is remarkable in a Scottish context (types follow Guido 1978). Blue annular and globular beads (groups 6 (iv) and 7(iv)) are long-lived but likely to include some Iron Age examples. More characteristically Iron Age are the annular opaque yellow beads known at Luce Sands (class 8). Luce Sands has also produced small globular beads in a visually similar opaque yellow. The form is otherwise extremely unusual, as Henderson (1987a, 181; 1997, 97–98) notes; he comments on a couple of larger examples from Meare

East (Somerset), but rather more parallels come from Ireland (Co Armagh, Down and Galway). Most of these are also rather larger, but the necklace from a grave near Donaghadee (within view of the Wigtownshire coast) contains beads identical in size and form (Henderson 1987b, fig 2a). This strongly indicates a shared tradition across the North Channel; the existence of a couple of deformed examples from Luce Sands suggests that this may be one production site.

Another unusual find is the group of opaque red beads from Airrieolland crannog, their form closely similar to class 8 ones but their colour quite different ([Illus 163](#)). There are other, rare examples of red Iron Age beads in Scotland (eg Dun Ardtreck, Skye; Dun Vulcan, South Uist; MacKie 2000, 387, no 51, [illus 24](#) & [28](#); Parker Pearson & Sharples 1999, 39), and a couple of opaque red bead fragments from Luce Sands hint again at a local tradition.

Black shiny jewellery

The range of types attested in glass is mirrored and supplemented in jewellery of black, shiny organic-rich stones – shale, lignite, cannel coal and jet (there has been little analysis to clarify the raw materials). Bangles are the predominant type, supplemented by beads in various forms and toggles, as well as finger rings and various pendants.

The picture is absolutely dominated by the Luce Sands assemblage (with at least 240 finds), but it is worth looking at excavated finds first. Such jewellery (particularly bangles) is attested in small numbers, with ten finds from six other sites ([Table 23](#)). Working evidence is known from three sites, which raises interesting issues of resource procurement: the raw materials are not available locally, implying the import of blocks or partly-worked roughouts in some quantity ([Illus 164a](#) & [b](#)). The source remains uncertain, but suitable materials are known in Ulster and Ayrshire. Luce Sands was clearly a focus of import and manufacture, with some 20% of finds being unfinished. The Cults Loch and Fox Plantation finds could be accessing material imported through the Sands, but the unfinished ring from Dowalton shows that procurement networks stretched into the Machars as well. The details of how production and distribution operated, and how this varied, are unclear – the Luce Sands collection focuses on material in the latter stages of production, and the suspicion must be that this is selective retention rather than a reflection of the import of near-complete bangles.

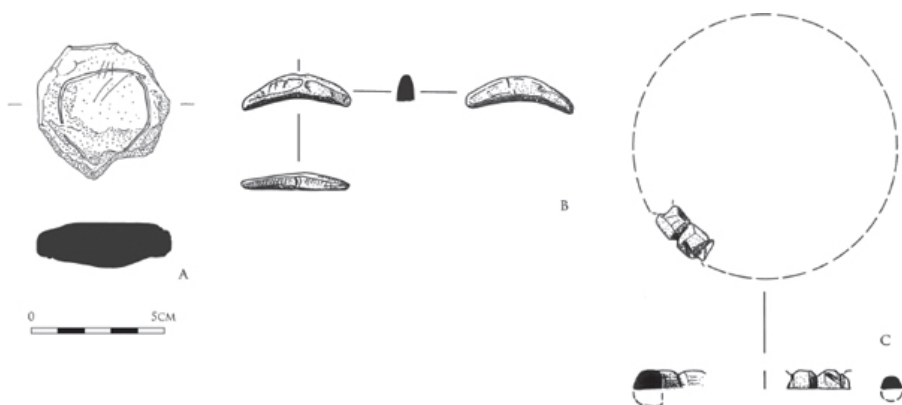
Table 23. Site-finds of black shiny jewellery.

<i>Material</i>	<i>Finished / unfinished</i>	<i>Sites</i>
Bangles	3/2	Airrieolland (repaired) Barhapple Cults Loch 3 (1 unfinished)
Bead	1	Fox Plantation (unfinished) Airrieolland (?flake from whorl)
Finger ring	1/1	Dowalton (unfinished) Dorman's Island
Ring-pendant	2	Airrieolland Barhapple

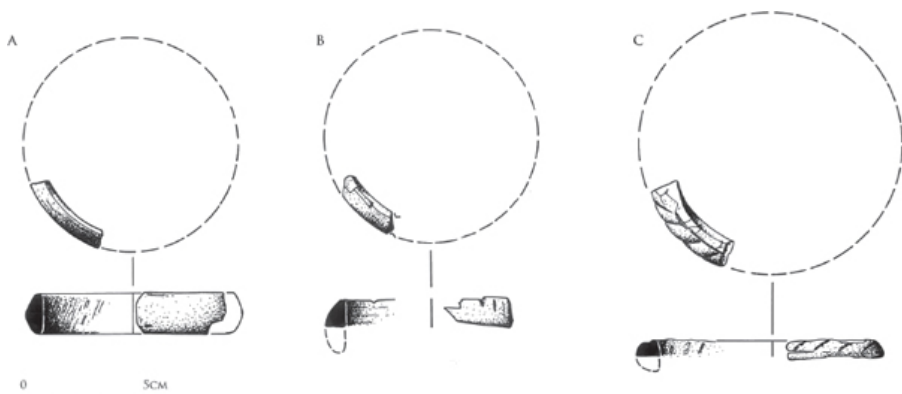
Provenanced stray finds comprise a large bangle from Kirkmaiden, a repaired bangle from Clayshant, on the edge of Luce Sands (Callander 1916, fig 13), and a bead or whorl from Upper Barr. The extensive manufacturing debris from Portpatrick is not considered here as it is most likely early Medieval in date (Callander 1916, 237; Hunter 2016).



Illus 163. Iron Age objects from Airrieolland crannog. From top – shale pendant, decorated copper-alloy fitting, and red glass beads. © Trustees of the National Museums of Scotland.



Illus 164. Shale and cannel coal artefacts: a. roughout, reusing a core from bangle production, Wigtownshire, unprovenanced (Stranraer Museum: 2009.31.6, illustration by John Pickin); b. bangle reworked into a toggle, Luce Sands (NMS: X.BH 8271); c. bangle fragment reused for bead manufacture, Luce Sands (NMS: X.BH 8292). illustrations by Alan Braby



Illus 165. Shale bangle fragments from Luce Sands, all NMS: a X.BH 8228; b with traces of decoration, X.BH 8217; c decorated, X.BH 8293. Illustrations by Alan Braby

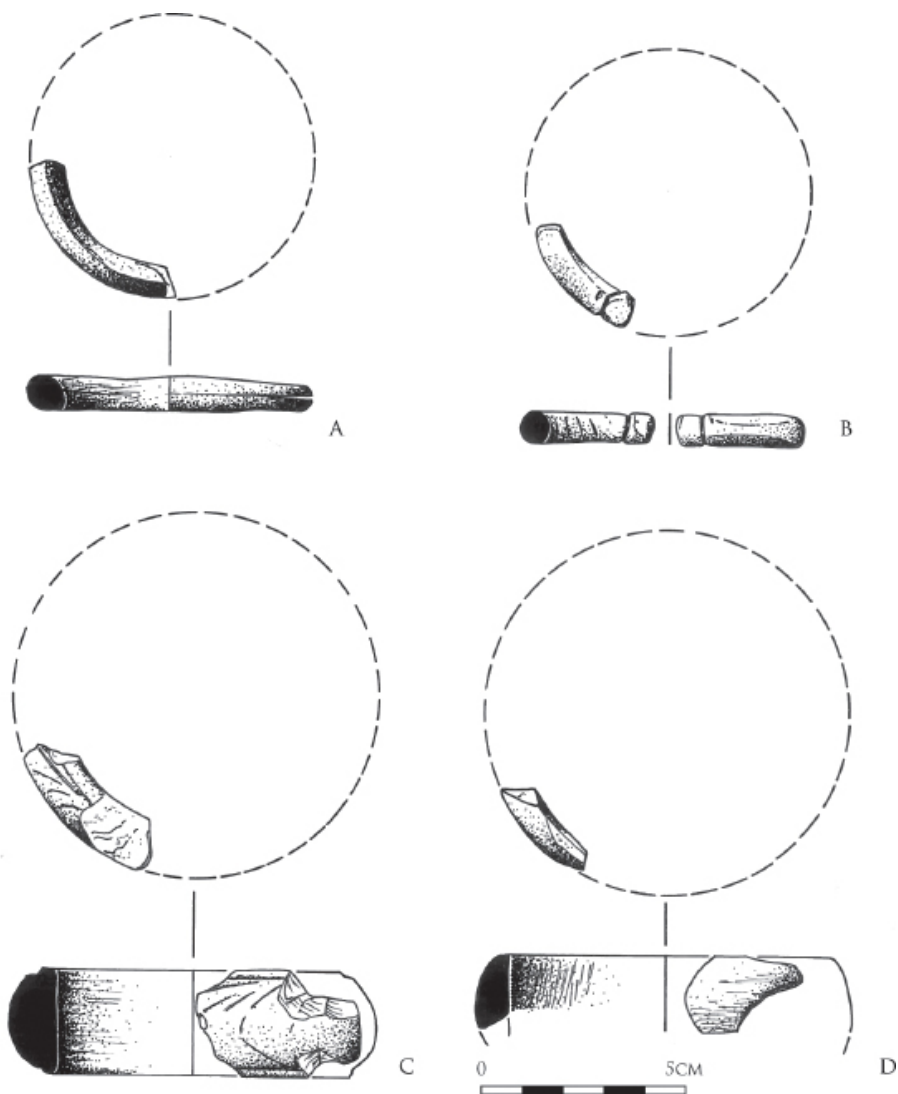
The Luce Sands finds provide a valuable indication of the range and use of this material; they will range in date from the later Bronze Age to the later 1st millennium AD, and typology has so far proved of little value in teasing the different finds apart. [Table 19](#) shows the proportions of different categories of material, indicating how much part-worked material or debris is present. Bangles dominate ([Illus 165](#) & [166](#)), in a wide variety of shapes, and including some of the rare tall, narrow form which is characteristically Iron Age (eg Stead 1979, fig 29.3). [Illus 162](#) plots the internal diameters: the resulting three peaks suggest these represent male, female and child ornaments. Despite their apparent abundance, they were clearly valued items: 6% show attempts to repair the broken fragments, and 14% show attempts to rework them into beads, pendants or other items ([Illus 164b](#) & [c](#)).

Of the other finds, finger rings likewise show a size range which hints at use by both sexes. The range of pendants includes both tusk-shaped pendants (reworked from bangles) and ring-pendants, a typical Iron Age form.

Contacts

The beads and copper alloy finds provide the best evidence of Wigtownshire's contacts in the Iron Age; almost all the evidence is from Luce Sands. Analysis of some of the yellow annular beads suggested these include the products of both NE Scotland and SW England (Henderson 1991, figs 4 and 5), although one should be a little wary of earlier models of centralised glass production sites: recent excavations in NE Scotland have shown glass-working did not just focus on Culbin, while the recognition of fragments of opaque yellow glass ingot from the fort of Dunagoil (Bute) shows that access to the imported raw materials of glass-working was more widespread (Hunter 2015; forthcoming). Yet SW English links are confirmed by at least one of the brooches (the mock-spring La Tène III style) and the 'Meare spiral' bead (its orange-yellow colour matches the English source rather than the lemon-yellow of the Irish source reported by Henderson (1987b, 33)). Southern contacts are also represented by the involuted brooch, though the source cannot be pinned down.

The evidence of links to NE Scotland is not restricted to a single analysed yellow glass bead: there are also beads of class 13 and 14, typical NE Scottish types. Examples from further up the west coast suggest a pattern of maritime distribution once they had moved westwards to the coast. Parallels for the yellow globular beads show connections to Ireland, especially the adjacent coast of Ulster, and this may be supported by the Nauheim variant brooch. The source of the black organic-rich stones is not yet known but it was clearly imported, most likely from Ayrshire or Ulster. More wide-ranging contacts are seen in an unusual class 7a bead from Kirkmaiden with an inlaid yellow lattice, which may well be an import from the Continent; it certainly saw heavy wear, indicating it was a prized item. In discussing contacts, it is worth noting the amber bead from Dowalton ([Illus 167](#)), though this could be early Medieval rather than Iron Age.



Illus 166. Shale bangle fragments from Luce Sands, all NMS: a X.BH 8254; b reshaped as a pendant, with grooved end for suspension, outer edge bevelled, X.BH 8268; c decorated with marginal borders and engraved scallops, X.BH 8294; d X.BH 8417. Illustrations by Alan Braby



Illus 167. A selection of artefacts from Dowalton. Clockwise from left; glass bangles, amber bead, Roman melon bead, samian potsherd © Trustees of the National Museums of Scotland.

Table 24. Range of different material types from various site types (excavated sites only)

Site type	Range of material types				
	1	2	3	4	5+
Crannog	2	1	2	1	2
Enclosure	4	–	–	–	1
Broch	–	–	–	1	–
Prom fort	1	1	–	–	–
Open/other	–	1	1	–	2

In terms of the other side of these contacts, it seems plausible that Galloway's metal resources were sought after, and circumstantial evidence suggests the Tonderghie mine may well have been used in the Iron Age. This wide range of contacts emphasises Galloway's central location in the western seaways (in contrast to its land communications, hemmed in by hills), and the centrality of Luce Bay, as a huge, accessible inlet with good landing possibilities in contrast to the harsh coast of the western Rhins or much of the Machars coastline. From the sea to the south, Luce Bay looks wide open – one would hardly realise it was a bay, and it is of little surprise to find so much

evidence of contact in the sands at its head.

Artefacts and society

The finds offer too few clues to allow any detailed reconstruction of change through the Iron Age: so few can be dated independently that any attempts to spot patterns would be overly-reliant on patterns seen elsewhere, so this will mostly be avoided. There is also distressingly little that can be said about variation between different sitetypes, largely because crannogs dominate the picture so much. The crannogs not only have favourable preservation conditions, but they have not suffered the effects of hundreds of years of ploughing. Despite this, none has yet produced a real wealth of finds (in comparison to Irish early medieval crannogs or rich Scottish Iron Age sites such as the lowland brochs), and in this they are similar to the dryland sites: it seems these settlements were kept clean, with rubbish disposal primarily taking place off site. This general tradition of cleanliness is one of the reasons why the Luce Sands finds, representing an off-site as well as an on-site signal, seem to give a better picture of the area's material culture, even if lacking in chronological subtlety.

A proportion of the material which does survive is likely to stem from deliberate deposits as part of rituals taking place at the site – this can be argued for the deliberately-smashed querns (although details of how they were deposited is inevitably lacking from older work), and also the remarkable intact iron tongs from Rispain, which came from a gully in the enclosure. Similarly, the intact ?shale bangle from the end of the causeway at Barhapple is plausibly a deliberate offering rather than an accidental loss. The generally poor bone survival makes it difficult to assess if there was also a tradition of structured deposits of human or animal remains, but the discovery of two human skulls from the ditch at Rispain (Barbour 1902, 624–626), with indications of post-mortem modification, fits a broader Iron Age pattern of the manipulation and social use of human remains in settlement contexts (eg Armit & Ginn 2007). Related use of human remains in settlements is seen in the cremated bone found in the settlements of Aird Quarry and Fox Plantation (Cook 2006, 13, 16; Wilson 2001, 78).

Table 25. Number of finds from different site types (excavated sites only)

<i>Site type</i>	<i>Number of finds</i>			
	<i><5</i>	<i>5-9</i>	<i>10-19</i>	<i>>20</i>
Crannog	–	4	2	2
Enclosure	3	–	1	–
Broch	1	–	–	–
Prom fort	1	–	1	–
Open/other	1	–	2	1

The pottery from Whitecrook is not included in the count as it may be LBA in date

The dominance of crannogs makes it tricky to assess how they fitted into the wider settlement pattern in terms of their material culture, but range and quantity of finds are useful ways to consider the evidence from excavated sites (Tables 24 & 25). Range is defined here as the number of different categories of material (using the classifications from the appendix). Crannogs stand out on both counts, and while preservation conditions will play a role, the contrast with both promontory forts and enclosures is striking. Only the rectilinear enclosure of Rispain shows a comparably rich and diverse assemblage – the curvilinear enclosures are markedly sparse in material. This hints at differences in chronology (Rispain being LIA, the enclosures E–MIA) or site function/status, though the picture is a blurred and imprecise one.

The only excavated lowland broch in the area, at Teroy, produced a very small assemblage. This is in notable contrast to many of the lowland brochs of eastern Scotland, often with rich assemblages (Macinnes 1984), but it would be unwise to make much of this without more excavation; the wealth of many of the eastern sites relates not just to their good preservation but their apparently rapid destruction, creating materially-rich deposits which were clearly not present within Teroy. Even so, the range of material from its very small assemblage is much greater than most excavated sites in the area, indicating this was rather out of the ordinary. The lack of work on the SW Scottish Atlantic roundhouses greatly limits any discussion of their role – although a stray find of a Roman coin at Crammag Head provides a hint of access to Roman goods at this broch-like structure, while sherds from Teroy were recently recognised as probable Roman coarse ware.



Illus 168. Bronze snake armlet from Barhullion. © Trustees of the National Museums of Scotland

The Roman world

Roman finds are relatively common on sites and as stray finds in the area, although always in small quantities and limited range. They have been discussed and summarised by Wilson (2001), and can be treated briefly here. Using methodologies which look at the range of finds rather than absolute quantities to allow for vagaries of taphonomy (Hunter 2001), the Wigtownshire sites show no sign of hierarchical patterns of access to Roman goods – all show only one or two types of Roman goods. While the sample is a biased one, it suggests a rather more segmentary society on existing evidence, in contrast to areas of SE and NE Scotland.

Vessels of pottery, glass and bronze are notably rare. Samian is represented only by fragments from the High Torrs burial (which also produced coarse ware), Castle Loch and Dowalton (the latter reused; [Illus 167](#)), glass only at Dorman's Island, bronze only by the magnificent patera from the bed of Dowalton Loch. Even brooches, normally the commonest ornament type, are unusual, with only four findspots (Garlieston, Cruggleton, Boreland of Longcastle and Luce Sands (two examples)). Instead, ornamental material is dominated by melon beads, with eight findspots – perhaps reflecting preferential selection because of the strong existing tradition of bead use. There is

also a notably varied range of other ornaments, with intaglio rings in silver and iron from Luce Sands (the latter from a burial), and a snake armlet from Barhullion ([Illus 168](#)). Coins are relatively few (once dubious examples from modern towns or with eastern-Empire mint marks are excluded), but two late Roman (4th century) hoards from Balgreggan and Stranraer suggest that Wigtownshire had an openness to contacts from the late Roman diocese: this is emphatically confirmed by the find of several hundred 3rd and 4th century coins from near the Piltanton Burn, their date range too broad for a hoard but similar to other, rare sites which have been interpreted as contact points with the late Roman world (Hunter 2010).

The striking Mercury figurine from Stelloch ([Illus 151](#)) and the presence of a miniature axe from the same farm suggest a ritual site here. The discovery of the Kirwaugh (Bladnoch) fortlet (*Britannia* 42 (2011), 336, fig 9) requires reconsideration of the location of Roman finds in terms of a likely Roman infrastructure of control in the area. Does the cluster of finds around Dowalton or Stelloch reflect proximity to a Roman road? Is the material from Luce Sands connected to proximity to the Roman road rather than its sea-borne contacts?

Conclusions

How should we weigh up this evidence? The task is not an easy one, for most sites produce only small assemblages, often conflated from several periods. Preservation biases mean that even on waterlogged sites bone and antler objects are exceedingly rare, as is iron, while many of the finds can be dated only in the loosest of ways – this is true especially of the stone tools. Yet the material tells some valuable tales – and the rich finds from the sand dune complex of Luce Sands are key, as we have argued that these random finds from across an occupied landscape give a better picture of the area's material culture than the finds from excavations in the heart of a site do.

A key theme is contacts and the area's openness to them, with seaborne traffic south as far as Somerset, across the North Channel to Ulster, and up the west coast, tying in to networks of material from NE Scotland. Where datable this is later Iron Age in date, from perhaps the 2nd century BC onwards. The widespread use of Roman material also reflects this openness, and we have suggested that the notable and unusual quantities of Roman beads rather than other ornaments perhaps reflect an existing preference for glass jewellery.

There are hints that some of this glass jewellery may have been made locally, notably the small yellow globular beads, and the wide

range of beads suggests this was a major focus of social interest. The other craft skill which is strongly represented is the working of shale and cannel coal, again for jewellery, and again reliant on imported raw material. Much more restricted was copper alloy working, found only on a few sites in low numbers. On current evidence, ironworking was also a rare skill, although the assessment of this is fraught with problems. Pottery, it seems, was entirely ignored – the area was genuinely aceramic, with no interest in the material.

There are hints in the finds of varying local practice and traditions, not just in skills such as glass-working but in preferences – the rarity of decorative metalwork, for instance, even in the extensive Luce Sands collection, links the area more to an Atlantic tradition where decorative metalwork was rarely deposited (the extent of its use is less clear). The rather idiosyncratic nature of the metalwork also points to more local habits – this is the only area of Scotland where brooches outnumber pins as clothes-fasteners, suggesting an openness to southern influences where brooches were prevalent.

This impression of local and regional trends is not simply restricted to items of metalwork and choices in personal ornamentation. Are we also seeing hints of local habits in terms of approaches to diet and cuisine implied by surviving stone tools? The surprisingly small quantity of quernstones from the region is difficult to interpret for a variety of reasons discussed earlier in this chapter. Inconsistent recognition of fragmentary examples and clear biases in artefact collection strategies has undoubtedly skewed the available data, but the general paucity of quernstones from this region appears to be real. This forces us to consider the possible social mechanisms that might underpin this pattern. One suggestion is that bread, using flour produced by grinding grain on stone querns, was a less prevalent component of later prehistoric diet in parts of Wigtownshire than other regions in Scotland. Cereals were undoubtedly cultivated and consumed in the region but is it possible that grains were typically incorporated into the local cuisine in a different way to that suggested, for instance, in SE Scotland, perhaps as porridges and stews rather than flour-based foodstuffs? Although this inference is entirely speculative, this picture of a distinctive local diet complements the evidence suggested by the cereal assemblages from the region (Robertson *infra*).

It is hard to interpret the material in social terms when so little is well-dated and when the range of sites excavated is so partial, but on current evidence, the spread of Roman finds implies a lack of marked hierarchies in the late Iron Age. This perhaps fits the dispersed, small-

scale nature of craft activities, with the arguable exception of Luce Sands where the concentration of black jewellery manufacture may represent a specialisation of the area.

One can always hope for the next big site, its wealth revealing new insights, its sequence providing muchneeded dating, and over time these will come. But Wigtownshire already has a big site – Luce Sands – which, for all its problems, offers valuable information, while the range of antiquarian assemblages, each small in themselves, cumulatively offer insights into life, craft and contacts in the Wigtownshire Iron Age.

8 The environment in and around Cults Loch

8A THE OFF-SITE PALAEOENVIRONMENTAL PROGRAMME

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Background

The key to any palaeoenvironmental analysis is sample material that is both proxy-rich and representative of the events being studied, in this case sediment columns or peat accumulations deposited during the period of occupation of the sites in and around the loch, ie from the mid-1st millennium BC to the early centuries AD. Multiproxy studies of deposits both in and at the margins of the loch have the potential to detect changes in the palaeoecological and geochemical record that can be related to anthropogenic activities; whereas proxy data sets from peat accumulations in the surrounding environment have the potential to reveal the local vegetation history and archaeological record at a more regional scale.

Evidence for the interaction of people with the landscape, and human activities on the later prehistoric sites around Cults Loch was sought through palaeoenvironmental assessment of central and peripheral loch deposits, peat accumulations adjacent to the loch, and peat sealed beneath collapsed archaeological features. Chronological control of the sediments was pursued through radiocarbon dating in the first instance.

Reconnaissance

Initial field reconnaissance focused on building a general picture of the sedimentary context of the loch through a programme of augering and coring which demonstrated that the natural sediments deepen to

the northwest and centre of the present waterbody, and that the island within the loch is natural. Extensive probing and investigative coring (Illus 169) demonstrated that sediments in the deeper NW extension of the loch basin vary from less than 1 m thickness to over 5 m and include basal sands and silts, a lower wood peat and upper herbaceous peat. Investigative coring around the outside of Cults Loch 3 demonstrated that the archaeology overlies c 1–2 m of organic woody sediment considered to be at least in part anthropogenic. These initial investigations demonstrated that there are potential repositories of palaeoenvironmental evidence within the loch that could provide information relating to the occupation of Cults Loch 1 and 3, and that the deep peat accumulation to the NW of the loch has the potential to elucidate the vegetation history, and to detect archaeological impacts, in a wider context.

Sampling

Peat

Following reconnaissance probing a peat column 4.6 m in length was extracted (Illus 169), using a closed chamber Russian corer. At this depth the sediment was stiff, and whilst probing suggested the accumulation was in excess of 5 m, the corer would not penetrate further. The column was subsampled in the laboratory and the subsamples submitted for radiocarbon dating in order to establish the timeframe of the accumulation and to check for internal chronological consistency. The results (Table 26.1) demonstrate that accumulation in the peat column spans from the mid-8th millennium BC to the early 5th millennium BC, with no apparent radiocarbon inversions. Whilst the peat is *in situ*, accumulation ceases or is truncated prior to the periods of occupation on Cults Loch 1 and 3 and thus has little potential for enhancing this study.

Alternative peat samples were recovered during excavation beneath the rampart collapse in Trench 5 on Cults Loch 4 (SS1 & SS4, Illus 111 & 169) as it was considered that these sequences may have contained secure sections relating to the occupation of the site. However, radiocarbon determinations from these samples (Table 26.2) demonstrate that they are not contemporary with the periods of site occupation.

A possible explanation for the lack of peat dated to younger than the Neolithic might be erosion of peat into the lake. As large parts of the eroded peat would end up in the lake sediments of Cults Loch, this might be investigated further by dating the organic matter of the loch

(see below). Peat exploitation probably took place, but it is difficult to assess the extent of it and the impact on the peat.

Loch sediment

A sediment core (Core A) was extracted approximately 18 m from Cults Loch 3 (Illus 169). The core contained 150 cm of well-preserved organic material and was initially considered suitable for multiproxy analysis directed at understanding the nature of the occupation on Cults Loch 1 and 3, and the impact on the local aquatic environment. Similar loch sediment studies on Irish sites, such as the crannog at Ballywillin, detected inwashed pollen and macrofossil taxa associated with on-site activities, whilst the chironomid taxa reflected the progressive change in water quality caused by the adjacent archaeological activity (O'Brien et al 2005). It was anticipated that a similar approach to the Cults Loch core would yield results that could aid interpretation of life on, and around, the loch.



Illus 169. Cults Loch showing location of sediment and pollen cores. The unlabelled points represent the extent of investigative coring around the crannog and in the NW terrestrialised corner of the loch

To establish the date range of the core five radiocarbon dates were

obtained at intervals along the column (Table 26.3). However, a number of radiocarbon inversions were apparent suggesting that the material derived in part from older reworked sediments as previously suspected. This prompted a further phase of fieldwork to recover more taphonomically secure samples for study.

This final phase of coring focused on sediment deposits within the loch itself. Sediments from the deepest part of the loch were targeted, to maximise the opportunities for detecting disturbances in the loch ecology. Being a small loch, it is likely that a central core would pick up local disturbances relating to the sites around the loch (Illus 169). Sampling focused on the upper 3 m of sediments where disturbances relating to activity around the loch would most likely be located.

A series of loch sediment cores was collected using a 1 m Livingstone corer. Core TCL1 (Illus 169) extended through 6 m of lake sediment. It comprised highly organic black silty lake sediment (gyttja) and contained high levels of small plant macrofossils, with occasional fragmented leaves and hazelnut shells. Preliminary investigations also demonstrated the presence of pollen and diatoms. It was considered the most appropriate column for further study.

Table 26. Radiocarbon dates from the sediment cores and peat deposits

<i>Sample code and info</i>	<i>Depth (cm)</i>	<i>¹⁴C yrs BP</i>	<i>Calibrated age (cal BC)</i>
1. the peat column			
GU-21808	49–50	4145±35	2880–2610
Peat core 1A			(95.4%)
GU-21809	74–75	4335±40	3090–2880
Peat core 1A			(95.4%)
Humic acid			
GU-21809	74–75	4390±40	3310–2900
Peat core 1A			(85.4%)
Humin			
GU-21811	99–100	4890±40	3770–3630
Peat core 1A			(95.4%)
GU-21812	149–150	Failed	
Peat core 1B			
GU-22131	149–150	5310±35	4260–4040
Core 1B Humic acid			(95.4%)
GU-22132	149–150	5425±35	4360–4230
Core 1B Humin			(95.4%)
GU-21813	224–225	6335±40	5470–5210
Core 2A Humic acid			(95.4%)
GU-21814	224–225	6375±40	5480–5290
Core 2A Humin			(95.4%)
GU-21815	449–450	8525±40	7597–7525
Peat core 3B			(95.4%)
2. Cults Loch 4, Trench 5			
GU-22722	0–1	3940±30	2570–2300
TR5 SS4 Humic acid			(95.4%)
GU-22723	0–1	4040±30	2840–2470
TR5 SS4 Humin			(95.4%)
GU-22724	0–1	2585±30	820–590
TR5 SS1 Humic acid			(95.4%)
GU-22725	0–1	2625±30	835–770
TR5 SS1 Humin			(95.4%)
3. Core A			
GU-18312		Sample failed	
Core A CL.A.1			
GU-18313		7130 ± 35	6070–5920
Core A CL.A.2			(95.4%)
GU-18314		7765 ± 35	6660–6490
Core A CL.A.3			(95.4%)
GU-18315		1.6019±0.0056	(Post bomb)
Core A CL.A.4			
GU-18316		5850±30	4800–4610
Core A CL.A.5			
4. Core TCL1			
GU-25026	29–30	6545±30	5558–5472
TCL1			(95.4%)
GU-25027	150–151	4225±35	2909–2679
TCL1			(95.3%)
GU-25798	301–302	4680±30	3624–3369
TCL1			(95.4%)

Core TCL1; age-depth model

To construct an age-depth model for the sediment column, terrestrial

macrofossil samples were collected from the core at 29, 150 and 301 cm depth and submitted for radiocarbon dating (Table 26.4). Results demonstrate that the uppermost sample has an older date than those beneath and most likely contains older reworked material. Similar issues have been encountered from loch sediments at other sites, including at Buiston Crannog, Ayrshire where problems with dating the sediments and creating a reliable age depth framework, limited the potential to undertake environmental reconstruction (Tipping et al 2000). A programme to investigate the possible cause/s of the radiocarbon date reversal at Cults Loch was pursued, with a view to developing a viable age depth model through a greater understanding of the potential influences on the radiocarbon dates. Initially a range of geochemical analyses was undertaken.

The older date of the uppermost sample compared to deeper sediments indicates that in the upper reach of the core the sediments have likely been mixed with old carbon. The handpicked plant macrofossils (terrestrial) could have originated from the nearby peatlands, where older material might have washed into the lake during, for instance, periods of low water level. The apparent age-reversal in the lake core supports the theory that peatland erosion is a source of organic carbon in the lake, with the younger upper peats being deposited prior to the erosion of deeper, older peats. The lack of macrofossils younger than the Neolithic in both the peat and the lake sediments might be explained by degradation of the upper peats by root action and microbial activity, leading to degraded or bare peat (Lindsay 2010). Initial occupation around the lake and construction of the crannog probably altered the drainage of the peat, which in combination with peat exploitation might have led to the loss of the upper peats. Loss on Ignition (LOI), Magnetic Susceptibility (MS) and X-Ray Fluorescence (XRF) were undertaken on the upper 3 m of lake sediments to explore changes in the deposition regime of the loch in order to test the hypothesis that older carbon could have been introduced to the upper core sediments through erosional events in the small catchment, which is only 0.67 km². However, the lake-catchment ratio is relatively large, with the lake surface making up about 10% of the catchment area, so the lake internal processes will have a substantial influence on the lake sediments.

LOI helps to determine the sediment composition (organic matter and carbonate content) and indicated that overall the sediments were rich in organic matter and very low in carbonate (Illus 170). The high organic matter content suggests rapid accumulation in a dysoxic to anoxic hypolimnion (bottom layer of water) where the decomposition

of organic matter is inhibited (Wetzel 2001). Towards the top of the core (around c 30 cm depth), there is a distinct decrease in organic matter and an apparent higher input of minerogenic matter. The uppermost samples indicate a reversion to higher organic matter content. MS can detect changes in the minerogenic content of the sediment and this trend of minerogenic input is repeated in the results from the MS analysis (Illus 170), with a distinct peak in the MS curve at around 10 cm.

XRF can detect changes in the concentration of specific elements and identified a distinct increase in several elements in the upper 30 cm (Illus 170). These can be grouped as erosional indicators (Zr, Rb and Ti) and indicators of hypoxia (Fe/Mn, Fe/Ti and Mn/Ti. Finally the lead content (Pb) indicates that lead accumulation increased dramatically in the upper c 15 cm of the core. The erosional indicators increase at c 105 cm and c 30 cm, reaching a maximum at c 20 cm depth and remain at elevated levels until c 5 cm depth. The increase around 30 cm is an almost perfect reflection of the LOI curve and confirms a real increase in minerogenic input in this upper section. The erosional indicators increase rapidly towards the top of the core, from c 20 cm depth, reaching a maximum at c 10 cm depth. The lead content has a maximum around 6.5 cm depth, which can be used as a chronological marker, as lead accumulation is known to have increased over the last c 150 years due to industrial and car emissions, with a maximum around AD 1970 (Farmer et al 1997; Brännvall et al 2001).

These analyses indicate that a distinct change in the deposition regime occurred around 30 cm depth. In these uppermost samples this has led to a reduction in organic content as well as increases in several elements (Rb, Si/Ti and Ti). Furthermore, the reduction in coarse to fine minerals (Ti/Rb) indicates that clays are a more important component of the upper sediments (Croudace et al 2006; Rothwell et al 2006). An increased erosional component deriving from inputs such as silts and clays would explain these changes. Post-industrialisation processes could explain these increases in erosion rates and heavy metal concentrations suggesting that the uppermost part of the core was likely deposited in the past c 200 yrs (Edwards & Whittington 2001). This would also explain the apparent older age of this level of the core as determined by the radiocarbon date. The consistently high organic matter content in the lower reaches of the core suggest that reworking of older sediments is less probable with the radiocarbon dates likely to be a reflection of the true age of these sediments. Results of the geochemical analyses indicate that despite the date

inversion it is still possible to make an estimate of the chronology of the sediments. Construction of reliable age depth models has been possible at other sites where sediment reworking has resulted in radiocarbon inversions. For example, Housley et al (2010) used a combination of radiocarbon dates and independent tephrochronological data from a sediment sequence influenced by fluvial activity and reworking in the vicinity of the historic site of Dunadd, Argyll, to develop a chronological framework against which to interpret local environmental fluctuations. At Cults Loch the geochemical signal interpreted as an indication of post-industrialisation processes provides independent chronological data.

By applying an approximated date of AD 1970 at around 6.5 cm depth, as derived from the geochemistry (Pb maximum), it is possible to propose a chronology for the sediments. Supposing that the lowermost radiocarbon date is correct (301 cm, c 3450 yrs BC), and the geochemical changes in the uppermost sediments (from c 6.5 cm, c AD 1970) are related to industrialisation in Scotland, a simple age-depth model (Illus 171) can be constructed using Clam 'classic' age-depth modelling (Blaauw 2010). Disturbances related to Cults Loch 3 might be located at a depth of c 139 cm, while those related to occupation on Cults Loch 1 might be represented in the record at a depth of c 101 cm. These depths are represented by dashed red lines on Illus 170–174.

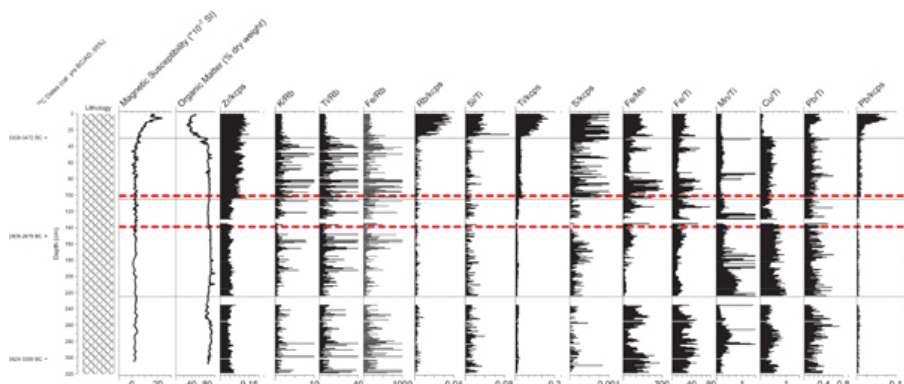
Whilst the LOI and MS do not indicate any further disturbances at these levels, the XRF does indicate disturbances in the record at these depths. A marked increase of Zr and to a lesser extent Ti indicates a change in sediment source, with more resistant minerals entering the lake, taking place around the same time as Cults Loch 3 (CL3) was built. Furthermore, the Fe/Mn indicates a distinct increase in hypoxia in the lake around the time of the construction of Cults Loch 1 (CL1). To further test for changes that could relate to occupation of Cults Loch 1 and Cults Loch 3, diatom and pollen analyses were undertaken on the core.

Lake ecology

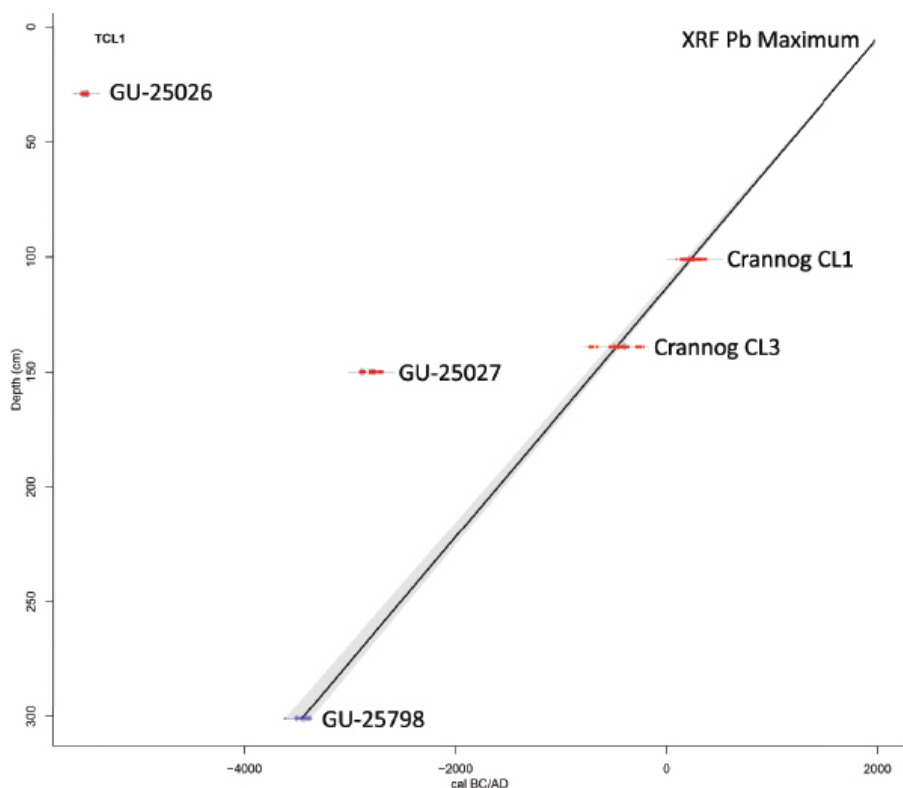
Diatom analysis can provide information on loch characteristics such as pH and water depth. By categorising diatoms with their environmental preferences (Van Dam et al 1994), as recorded from modern datasets, it is possible to analyse diatom assemblages to detect changes in the acidity of the lake in particular. As different taxa have different requirements, the diatom composition changes over time can be used to infer changes in the environment. The acidity of the lake

can be controlled by various factors, including the influx of humic acids, which can derive from anthropogenic sources. Thus, it was considered that diatom analysis of the Cults loch sediment core has the potential to detect sensitive changes in the loch ecology and enhance the information from the geochemical analyses in relation to anthropogenic activity. In particular it was considered that the diatom analysis might detect fluctuations in the pH or depth of the water possibly corroborating the proposed locations of Cults Loch 1 and Cults Loch 3 from the extrapolated age depth model.

Diatoms were counted at 8 cm intervals in the upper 300 cm of the core series (Illus 172). Most of the core is characterised by low species diversity, dominated by *Mayamaea atomus* (Lange-Bertalot 1997) and the fragilaroid taxa *Staurosira* cf *elliptica*, *Staurosira construens* and *Staurosirella pinnata*.



Illus 170. Results of the LOI analysis and selected XRF elements on core TCL1. Red dashed lines indicate probable depth of the crannog and promontory. Overall the core is rich in organic matter, apart from the upper 30 cm. Carbonate content is low (<5%) throughout the entire section analysed. The upper two core-sections (TCL 1.1 and TCL 1.2) were analysed with the ITRAX core scanner, averaged over 1 cm samples (original counts were at 1000 μm resolution) and normalized by counts per second, to account for changes in water and air content in the core. Intervals with a high MSE (>5) were excluded from the record



Illus 171. Clam age-depth model of core TCL1

Some difficulties arose due to the dominance of these small fragilaroid taxa because they can have overlapping morphotypes. For the purpose of this study these species have been classified according to the taxonomy of Krammer and Lange-Bertalot (1999a; 1999b; 2000; 2004). To assist with interpretation of the data Principal Component Analysis (PCA) was undertaken (Illus 172).

A biplot of the first two PCA axes demonstrates that the upper part of the core is very different from the remainder of the core (Illus 172). This is mainly caused by increases in *Aulacoseira alpigena* and *Stauroforma exiguiformis*. The rest of the samples are more likely controlled by changes in the abundance of *Staurosira construens* var *venter* and *Mayamaea atomus* (indicated as siven and myato respectively). A CONISS cluster analysis was performed, which identified five distinct zones in the profile.

Zone TCL1_D1 (300–252 cm)

Characterised by high values (up to 40%) of planktonic diatoms, mainly *Aulacoseira subarctica* and *Aulacoseira italica*. At this level in the core planktonic taxa occur more frequently, eg *Aulacoseira*

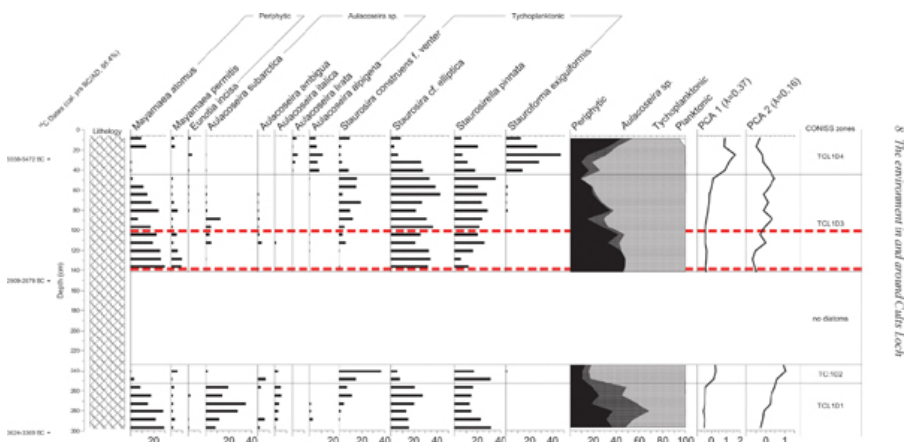
subarctica is present at up to c 35%, 297–254 cm depth. *Aulacoseira subarctica* is often considered a mesotrophic taxon, able to thrive under high nutrient and low-light conditions (Gibson et al 2003). The rest of the diatom valves in this zone consist of abundant *Mayamaea atomus*, *Staurosira* cf *elliptica* and *Staurosirella pinnata*. The abundance of *Staurosira* cf *elliptica* and *Staurosirella pinnata* indicates turbid waters, with the presence *Mayamaea atomus* reflecting a high amount of dissolved organic matter in the lake.

Zone TCL1_D2 (252–220 cm)

Characterised by a rapid increase in fragilaroid taxa *Staurosirella construens* var *venter* and *Staurosirella construens* var *exigua*, *Staurosirella pinnata*, followed by an increase in *Pseudostaurosira elliptica*. Concomitant decrease in planktonic and periphytic taxa. The reduction in planktonic taxa could reflect a shallowing of the loch or the creation of a shore-like environment supporting both periphytic and disturbance preferring diatoms. This could be explained by the raising of the loch bed through natural or anthropogenic means, such as the construction of an island or platform within the water.

Zone TCL1_D3 (220–140 cm)

Between 224.5 cm and 136.5 cm depth the diatom counts were too low to be reliable ($n < 50$). The assemblage at these intervals consisted mainly of the central areas of several naviculoid taxa (mainly *Pinnularia* and *Navicula*), as well as the occasional fragilarioid frustule. Previous studies have indicated that in naviculoid diatoms, the proximal raphe ends are often all that is preserved in the final stages of dissolution (Ryves et al 2009). Therefore it is likely that this interval was characterised by a high amount of dissolution of diatom frustules. Dissolution of silica is driven by changes in pH, temperature and decomposition (Marshall 1980; Ryves et al 2006; Barker et al 1994).



Illus 172. The relation between the dominant diatom taxa (> 5% in a single sample) and the first two PCA axes

Zone TCL1_D4 (140–44 cm)

Diatom accumulation increases again, allowing interpretation of the assemblages. This zone is dominated by the small fragilaroid taxon *Staurosira cf. elliptica*. *Mayamaea atomus* is abundant at the base of the zone, but appears to steadily decrease towards the top of this core, while *Stauroforma construens* var. *venter* and *Stauroforma pinnata* increase slowly. Between 118.5 cm and 88.5 cm depth there is a small increase in *Aulacoseira subarctica*, possibly indicating an interval with increased water depth. The age-depth model (Illus 171) suggests that Cults Loch 1 is contemporary with the middle deposits of this zone of the core (101 cm) and indicates a short interval with reduced *Aulacoseira* sp and increased periphytic taxa, which could be explained by the construction of the crannog. The additional shallow water environment would lead to increases in sediment dwelling and periphytic taxa, while the increased lake circulation could lead to the apparent reduction in *Aulacoseira ambigua*, as this taxon is known to more likely remain in suspension in turbulent waters (Poister et al 2012).

Zone TCL1_D5 (44–0 cm)

The top zone is characterised by increases in the planktonic taxa *Aulacoseira alpigena*, *A. lirata*, and the fragilaroid *Stauroforma exiguiformis*. These species are more oligotrophic and more acidophilous than *Mayamaea atomus*, *Staurosira cf. elliptica* and *S. pinnata* and could be related to a reduction in nutrient levels and reduction in pH. XRF analyses (Illus 170) demonstrated increases in erosional indicators at this level in the core.

Diatoms as environmental indicators

Overall the diatom assemblages are dominated by alkaliphilous taxa ([Illus 173](#)). However, in the bottom and top of the sections analysed (TCL1_D1 and TCL1_D5) there are somewhat lower abundances of alkaliphilous taxa, coinciding with increases in circumneutral and acidophilous taxa. Although the decrease in alkaliphilous taxa in the upper part of the core appears to precede the changes in the geochemistry the acidification is most likely related to post-industrialization changes in land use. In SW Scotland (ie Galloway) it is well known that acidification took place in the last c 200 years from other diatom studies on lakes (eg Battarbee et al 1984). Around the time of Cults Loch 1 (101 cm) there is an increase in acidophilous diatoms, which might be related to more humic compounds washing into the lake from during crannog construction. A similar process was inferred from the diatom assemblages of Lough Kinale during the construction of Ballywillin crannog (Selby et al 2005).

The diatom record indicates a possible shallowing of the loch in zone TCL1_D2 which could be explained by the existence of a shore-like environment around an island or structure such as a platform or crannog. The reappearance of the diatom frustules in the sediment record from *circa* 140 cm depth might be explained by changes within the lake, as the Clam age- depth model ([Illus 171](#)) indicates that Cults Loch 3 was built when these sediments were deposited. As the periphytic taxa occur in much higher levels from zone TCL1_D4 compared to zone TCL1_D3, it is likely that more diatoms from shallow water conditions and or submerged macrophytes are accumulating in the sediment.

Pollen

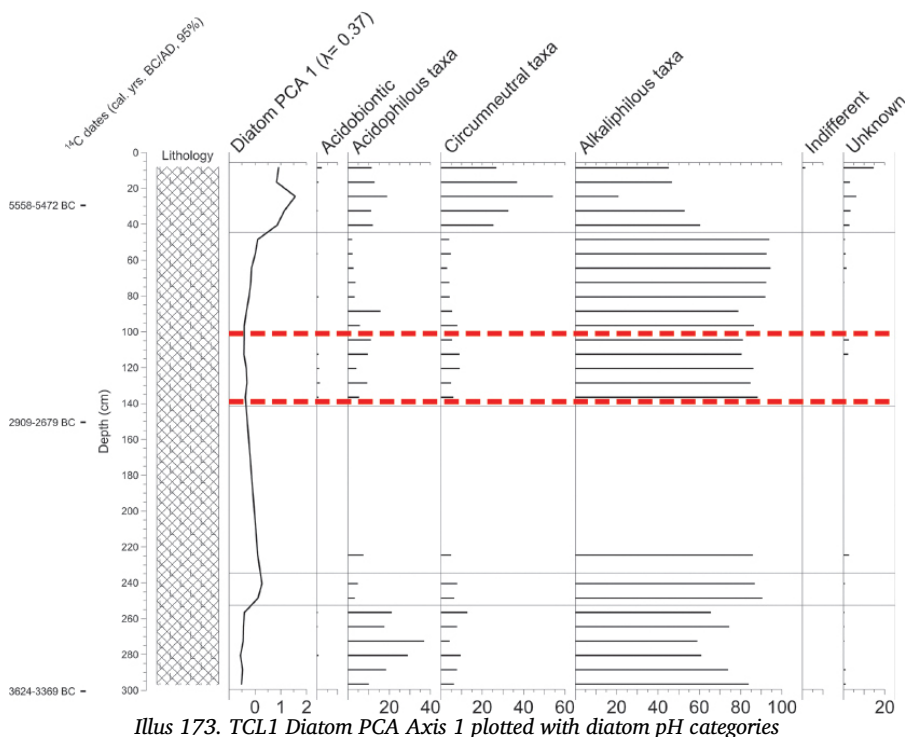
Pollen analysis can provide information on the vegetation of the catchment area and detect changes and disturbances such as the clearance of woodlands and the creation of arable fields or pastures. Correlation of the Cults Loch pollen record with changes in the post-glacial vegetation history from other sites (Birks 1972; Jones et al 1989; Tipping 1994) might also aid in supporting the proposed age-depth model. O'Brien et al (2005) and Fredengren et al (2010) were able to detect disturbances in the pollen record of Lough Kinale, central Ireland, including a high accumulation of *Hordeum*-type (barley) grains, related to the occupation of Ballywillin crannog. Thus, it was considered that pollen analysis of the Cults loch sediment core had the potential to detect changes in pollen source input to the loch

and enhance the information from the geochemical analyses in relation to anthropogenic activity. In particular it was considered that the pollen analysis might detect evidence relating to occupation of Cults Loch 1 and Cults Loch 3, thereby corroborating their proposed locations from the extrapolated age depth model in addition to providing information about activity on the sites.

Pollen samples were prepared from the same depths as the diatom analysis. A CONISS cluster analysis was performed to zone the pollen diagram (Illus 174).

Zone TCL1_P1 (305–232.5 cm)

This zone is characterised by a high amount of AP (c 80%), appearing stable throughout this zone. The NAP (c 20%) are composed predominantly of Poaceae (grasses) and Ericaceae (heather), but also include *Plantago lanceolata* (ribwort plantain). Around 250 cm depth there appears to be a maximum in Ericaceae. This zone indicates some nearby pastures and grasslands, surrounded by mixed oak woodland.



Zone TCL1_P2 (232.5–144.5 cm)

There is an increase in AP (up to 90%) at the base of zone 2, mainly driven by an increase in *Quercus* (oak), coinciding with a distinct

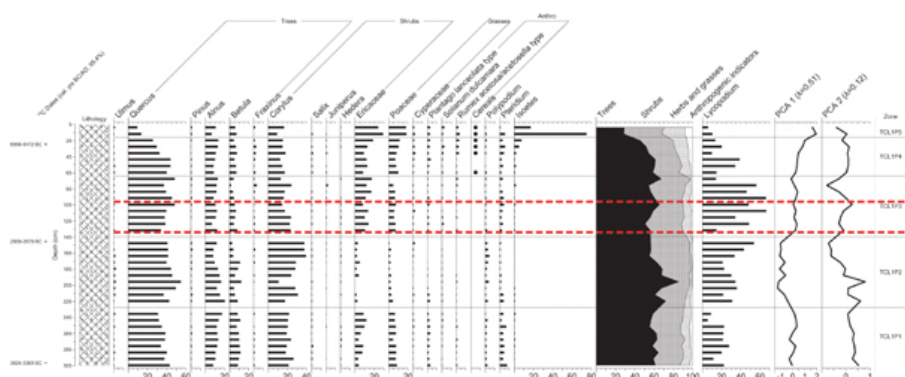
reduction in *Ericaceae*, as well as a reduction in *Poaceae*. These high AP values remain high throughout this zone. The upper half shows replacement of part of the *Quercus* woodlands by *Corylus* (hazel). It is likely that the woodlands opened up for short intervals. However, this was followed by secondary woodland regeneration of hazel, similar to other parts of southern Scotland (Tipping 1994).

Zone TCL1_P3 (144.5–68.5 cm)

In this zone the NAP returns to previous values with increases in both *Poaceae* and *Ericaceae* and a decrease in *Corylus*, indicating an opening of the woodland canopy. This zone might indicate the clearing of parts of the woodland in favour of pastures or crop fields. It is likely that this is a phase of intensified human impact. During this zone there are intermittent increases of anthropogenic indicator taxa, which might reflect creation of short-lived meadows. The start of this zone is around the probable depth of Cults Loch 3 (c 139 cm), indicating that it is likely that when the site was constructed, some deforestation had already taken place in the catchment. However, this reduction in woodland cover is probably greater, as arboreal pollen tend to be overrepresented in the assemblages (Fyfe et al 2013; Sugita et al 1999). Furthermore, around the time of Cults Loch 1 (c 101 cm) there is a marked increase in anthropogenic indicators, indicating meadows in the catchment (Behre 1981).

Zone TCL1_P4 (68.5–20.5 cm)

This zone shows a steady increase in heather, with a reduction in oak pollen, while the other AP genera remain stable. This zone also shows an increase in anthropogenic indicators including an increase in pastures in the surrounding area and a clearing of the mixed oak woodlands. The reduction in *Lycopodium* spike indicates an increase in the pollen accumulation rate. Towards the top of this zone there is a rapid increase towards higher NAP values, with increases in anthropogenic indicators (ie *Plantago lanceolata* and *Rumex acetosa/acetosella* (sorrel) types). This probably reflects increased deforestation in the medieval period (Oram 2001).



Illus 174. Pollen and spore diagram of core TCL1. Percentages for both pollen and spores are indicated against total pollen count (AP+NAP). The *Lycopodium* spores are represented as the percentage of pollen grains counted. Anthropogenic indicators are composed of *Plantago lanceolata* type (plantain), *Rumex acetosa/acetosella* type (sorrels), *Sanguisorba minor* type, *Chenopodiaceae* (goosefoot) and cereals (*Hordeum*, *Secale*, *Avena/Triticum* types) following Behre (Behre 1981). The presence of cereal pollen is indicated by markers in the *Poaceae* graph. On the right are the 5 zones as indicated by the CONISS cluster analysis, as well as the first PCA axis

Zone TCL1_P5 (20.5–8 cm)

The uppermost zone shows a rapid increase in NAP, a massive increase in the aquatic spores of *Isoëtes* as well as a reduction in the *Lycopodium* spike. This indicates that the pollen accumulation has increased during this interval. The increase in *Isoetes* could be interpreted as a phase where the loch had an extensive shallow shoreline. Potentially this could relate to drainage of the loch level, which took place in the 18th and 19th centuries. As other studies in the area (Birks 1972; Ramsay et al 2007) indicate a substantial increase in *Pinus* pollen in the uppermost samples, it is possible that the very top of the core was lost in the coring process. However, in nearby Round Loch of Glenhead, no such dramatic increase in pine pollen was found (Jones et al 1989), and given the small catchment of Cults Loch, it is possible that the lake is not as heavily influenced by pine plantations as other parts of Dumfries and Galloway (Gilbert & Wright 1999). The geochemistry indicated an increase in erosional indicators during this zone, which correlates well with the increase in pollen accumulation. It is likely that there is a higher amount of terrestrial material washing into the lake, thus increasing the amount of pollen. Given the reduction in arboreal pollen in this zone, and the likely under-representation of herb and grass pollen (Sugita et al 1999), it is likely that the woodland was relatively open.

Pollen as environmental indicators

Overall the core is dominated by arboreal pollen (AP) grains, mainly

Quercus, *Corylus*, *Alnus* (alder) and *Betula* (birch). This indicates the presence of mixed deciduous woodland in the catchment throughout the period of sediment accumulation. Poaceae (grasses) and Ericaceae (heathers) are also recorded throughout signifying the presence of grasslands and moors in the vicinity of the loch. The first PCA axis appears to respond mainly to the NAP percentage, indicating that the pollen assemblages are driven by the opening and regeneration of the woodlands. There is a large increase in both Poaceae and Ericaceae towards the top of the core, probably related to increases in heathlands on the nearby uplands. In the core from Round Loch of Glenhead (Jones et al 1989) *Calluna* (common heather) increases in abundance between 5450–4200 years BP (ie c 4300–2800 BC), indicating that woodland reduction and catchment disturbances have taken place in the uplands since the Bronze Age. When comparing the Cults Loch pollen diagram with nearby vegetation profiles there are several notable differences. In TCL1 *Fraxinus* (ash) is present in low numbers throughout the core, similar to a core from Round Loch of Glenhead (Jones et al 1989). The presence of *Fraxinus* is probably a response to early woodland disturbances in the area and indicates that the bottom of the core is probably younger than 5000 ¹⁴C BP (ie c 3800 BC), when occurrences of *Fraxinus* are first detectable in the area (Birks 1972; 1989). This agrees with the radiocarbon date at the bottom of the core, as it is younger. However, in Rispsain mire *Fraxinus* is absent until c 1100 BC (Ramsay et al 2007). This indicates that uncertainties in dating and/or local vegetation can have a substantial impact on the interpretation of pollen records and care has to be taken correlating pollen records, even over medium distances. The pollen assemblage from TCL1 contains some similarities with nearby sites, with evidence of early deforestation and weed taxa near the bottom of the core. There are also some notable differences with nearby cores, as the *Calluna* rise occurs during the Bronze Age in the upland Round Loch of Glenhead, while it appears later in lowland Cults Loch, during the Iron Age. This might be due to the catchment elevation of these lakes, though it might also highlight the dating uncertainties of Cults Loch. Overall it can be inferred that the vegetation around Cults Loch has been influenced by human activities prior to the construction of Cults Loch 3 and that it intensified during the construction of Cults Loch 1. Deforestation accelerated further from the medieval period (68 cm, c AD 1100). There was no evidence in the pollen record of direct human activities on the loch, such as the highly elevated values of *Hordeum*-type pollen found in Lough Kinale, related to cereal processing or storage (O'Brien et al 2005).

Discussion and conclusions

To investigate environmental changes in the sediments from Cults Loch that could be related to occupation in and around the loch, a multi-proxy analysis was undertaken, consisting of LOI, MS, XRF, diatom and pollen analyses. Establishing a chronology for the core proved problematic as radiocarbon analysis indicated an older age for the upper sediments, compared to sediments at c 3 m depth. Geochemical analyses indicated that the upper sediments (top 30 cm) contained disturbances related to modern anthropogenic disturbances (ie increased erosion rates, acidification and increases in heavy metals). It is likely that some older organic matter has been mixed in with the sediments, perhaps more intensely in the upper sediments.

The most pronounced change in the core is in the upper c 40 cm. These uppermost sediments indicate increased erosion rates (LOI, MS, XRF) as well as acidification (diatoms) and opening of the woodland (pollen). This can be interpreted as most likely related to fairly recent (last c 150 yrs) changes in the land use towards meadows and pastures, which is currently what exists around the loch. As a low amount of *Pinus* pollen was identified in the upper sediments, there is some doubt on how recent these sediments are. However, other studies in the region (Birks 1972; Jones et al 1989; Ramsay et al 2007) describe different abundances of *Pinus* pollen, reflecting the variance in local pollen archives (Tipping 1997b). Cults Loch has a very small catchment (0.67 km²) with only some small patches of pine woodlands within a 1 km radius. When comparing the terrestrial and the aquatic records, it would appear that the aquatic record lags behind with regards to this change, as the pollen record indicates that these changes have started from about a depth of c 70 cm, while the diatoms do not pick up the acidification until about 45 cm depth.

The next most pronounced change in the palaeoenvironmental record is between c 230 and 140 cm depth, with the dissolution of the diatoms (TCL1_D3), as well as a pronounced reduction in NAP (TCL1_P2). Furthermore, there are increases in XRF erosional indicators. These depths coincide with the construction of Cults Loch 3, as inferred from the Clam age-depth model. As diatoms are dependent on silica to build their frustules, it is likely that additional sediment loading to the lake led to higher accumulation rates of diatoms. However, why the diatoms were absent in the first place remains uncertain. A possible explanation might be that, as indicated by the high amount of alkaliphilous diatoms, the pH of the lake was relatively high prior to the construction of Cults Loch 3, which might have led to increased diatom dissolution (Barker et al 1994; Ryves et

al 2006). The interpretation of this section of the core is complicated by the lack of a robust chronology, as the radiocarbon dates indicate that from the Bronze Age and earlier this section contains organic matter. As both before (TCL1_P1) and after (TCL1_P2) there appear to be higher amounts of NAP, it could be that these periods are related to a phase with reduced human impact, which in Snide Bog (Birks 1972) and Carsegowan Moss (Dumayne-Peaty 1999) was related to post-Roman and medieval woodland regeneration in Galloway around periods of war.

Assuming that the age model estimate based on the lowermost radiocarbon date and the upper date for industrialisation is correct, Cults Loch 3 would be located around a depth of 139 cm. The construction of this site might be indicated at the bottom of pollen zone TCL1_P3, where there is an increase in NAP. The reappearance of the diatoms in zone TCL1_D4 might be related to Cults Loch 3 as well, for instance by additional humic substances being added into the lake from the crannog, lowering the pH and reducing silica dissolution. Cults Loch 1, which would be located at around 101 cm depth, appears to be related to an increase in periphytic diatoms and a minor increase in NAP, related to an increase of benthic/shallow water environments and increased deforestation in the catchment. However, it is difficult to robustly determine if the disturbances in the palaeoenvironmental records of Cults Loch are related to either site or both, due to the uncertainties of the age-depth model. Furthermore, changes in the record could also be related to climatic changes, especially in the lower part of the core, or human activity in the catchment rather than the lake itself. There is some support for increased pastoralism in the uplands, similar to SE Scotland (Tipping 2010).

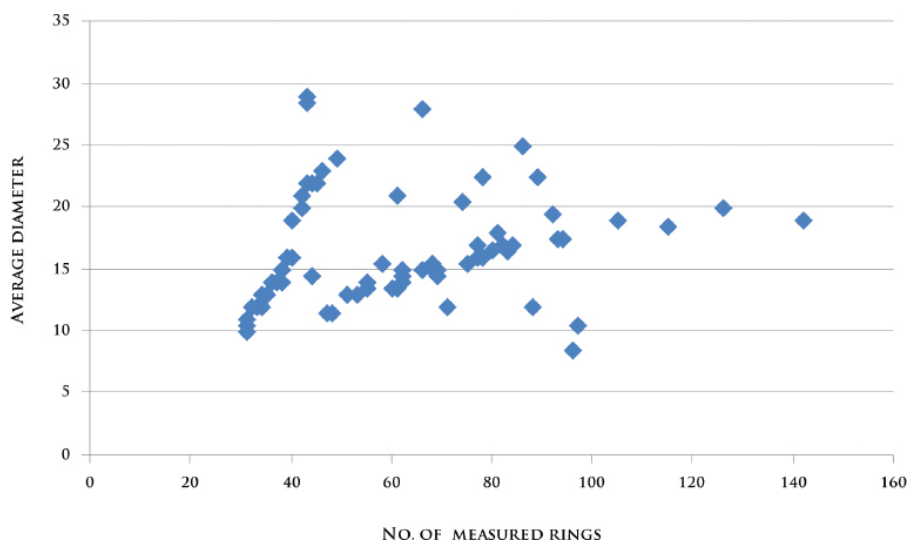
8B THE ON-SITE EVIDENCE FOR THE ENVIRONMENT AROUND CULTS LOCH

On the whole the macroplant assemblage from the crannog indicates the types of environments that one might anticipate around the loch, with plentiful rushes and sedges gathered from around the shores of the loch and the weed taxa indicating damp and disturbed ground. There is also a strong heathland component, reflected in the peat, mosses and bracken. The peat could have been cut from the mire immediately west of the crannog; peat-cutting could also be one of the reasons for the absence in that area of any sediments contemporary with occupation on the crannog (see above). The occupants of the crannog clearly cultivated crops and so there must have been arable fields around the loch but the insect evidence suggests that pasture for grazing animals may have been the dominant form of landuse around the loch (see [Chap 2c](#)). These habitats, grassland and heath, are also indicated in the pollen content of the cored sediments (see above).

The palynological analysis of the cored sediments also suggests that there was mixed deciduous woodland, composed of oak, hazel, alder and birch throughout the period of sediment accumulation in the loch, and the dendrochronological analysis ([Chap 2b](#)) has provided more quantitative evidence for the type of woodlands available to the crannog-builders. Although the ring-sequences of much of the oak are incomplete and consequently, do not accurately represent the original age structure of the assemblage, they nonetheless do suggest that a variety of different woodland types were being exploited.

The majority of the oak has come from trees mostly under 80 years of age ([Illus 49](#)) but there are also a number of timbers, ie T923, T927, T962 and T964 which have been converted from trees of extraordinary age. These are all planks, either half logs or chords (see [Chap 2e](#)), and are characterised by extremely compressed ring-patterns of over 200 rings. Most of them have been flattened and distorted by decay so estimates of their original diameters and thus, their full cambial age are difficult. Some curvature of the bark edge survived on T927 so an attempt at estimating its diameter and age has been made. The diameter is probably between 0.74 m and 0.88 m and in the measured portion there was an average of 27.5 rings per 10 mm; this would give an age of between roughly 1000 and 1200 years. The early growth of the tree will have been much faster, and it is also possible that the compressed growth in the outer 80 mm (the thickness of the plank fragment) is a result of trauma and that the rest

of the ring-pattern is much faster-grown, but even making allowances for these factors T927 may well be from a tree of between 500 to 700 years of age at the very least. The contrast with the largest timber found on the crannog, the log T961 is striking. This timber had a comparable diameter of 0.80 m but with only 137 rings it had the fastest growth rate recorded in the assemblage, an average ring-width of 2.9 mm compared to 0.36 mm for T927. Other timbers from the crannog also show that the builders had access to some very large oak trees. The curvature of the gigantic burr which T157 has been fashioned from (see [Chap 2d](#)) suggests a tree in excess of 1.2 m diameter, while the radially-split oak planks (111) came from trees well over 0.7 m in diameter (see [Chap 2e](#)). Thus, there is evidence at Cults Loch that young oak woodland which had been frequently cut over, as well as ancient, virgin woodland was accessible to the builders of the crannog.



Illus 175. Relationship between age and diameter of alder from Cults Loch 3

In [Chapter 2a](#) it was argued that the lack of internal correlation within the alder assemblage reflects diverse growing conditions and the great variety in age and size displayed by the alder bears this out. Timbers varied in diameter from 0.09 m to 0.29 m and in age from 30 years to 142 years ([Table 5](#)) and there was little correspondence between size and age ([Illus 175](#)); for example, two timbers both 0.19 m in diameter produced sequence lengths as diverse as 36 rings and 115 rings. As noted in [Chapter 2a](#) local factors rather than climate appears to be the major factor affecting growth in alder and the determining factor appears to be groundwater conditions (Douda et al 2009, 9–10). The alder used at Cults Loch 3 may thus have come from

environmental niches in which groundwater conditions varied considerably. Much of it may have been felled in the carr woodland which probably grew in and around the marshy area in the NW corner of the loch but some of the timber may have come from further afield, from around the drier shores of the Black Loch to the west of Cults Loch as well as the better drained slopes on the foothills of the Cree-Luce moors.

Apart from alder and oak the only other wood species present on the crannog were hazel, willow and birch. Small hazel roundwood was used in the construction of hurdle panels for walling and flooring, and hazel was also the most important fuel species, so it is safe to assume that hazel coppice was a common component of the landscape. If we assume that the 'Principle of Least Effort' (Shackleton & Prins 1992) applied to the collection of firewood then the hazel coppice was not far distant from the crannog. The oak and alder used as fuel may have come from the trimming of timbers for construction; very few waterlogged offcuts were found on the crannog (see [Chap 2e](#)) and while some woodworking would have been done in the woodland and on the shore the shaping to particular sizes would surely have happened on the crannog, the debris being thrown on the fire. Birch and willow were used in insignificant amounts for both construction and fuel so it seems most likely that they were not commonly found in the landscape, although willow was also used in the hurdle panel (513) and so may have formed a minor component of the coppiced woodland.

Surprisingly, tree- and wood-related insect taxa were poorly represented on the crannog, particularly those associated with dead wood. One possible explanation is that dead wood habitats were uncommon in the immediate vicinity, which would mean that the woodlands were some distance from the crannog. Another is that fresh timber was brought onto the crannog only for construction and that peat or turves were used more commonly for fuel than dead dry wood. Burnt peat is common throughout the deposits but the charcoal testifies to the use of wood for fuel too.

9 Liminal living in a dynamic landscape?

9A CULTS LOCH 3; CHRONOLOGY, FORM AND FUNCTIONALITY

In this section the significance of the evidence from Cults Loch 3 is evaluated in terms of its contribution to our understanding of the chronology and form of Scottish crannogs in general. Finally, its functionality and the motivation for building and living on the water are explored in the light of the evidence from Cults Loch.

Chronology

The combined chronological evidence suggests that the crannog was probably occupied for a short period in the late 5th century BC, probably for little more than half a century. The crannog was subsequently abandoned until the early 2nd century BC when the causeway was refurbished and stone structures may have built on the crannog, building activity which may be associated with the Phase 2 re-occupation of Cults Loch 5 ([Chap 6](#)). Occupation in the late 5th century BC may not have been continuous; there is some evidence for periods of abandonment and the repeated cleaning and resurfacing of the floors observed in all the structures may represent a form of spring-cleaning when returning to the crannog on an episodic basis.

The Cults Loch data contributes to the incipient evidence for episodic use of crannogs on both a centurial and possibly annual basis. Examination of the chronological dataset for Scottish crannogs suggests that crannog construction and occupation was not continuous throughout the 1st millennium BC (Crone 2012, 161); rather, the available dates suggest that there may have been discrete episodes of use in the 5th and 2nd centuries BC. The Cults Loch data forms part of this evidence, as does the dendrochronological evidence from Dorman's Island and the wiggle-match date from Oakbank Crannog

(ibid). It is reflected in the pattern of radiocarbon dates from the Loch Tay crannogs which suggests that some of the crannogs are either built in the middle of the millennium or late in the millennium, but never in both periods on the same site. More locally, there are both mid-1st millennium BC and later 1st millennium BC radiocarbon dates from Milton Loch 1 and the Black Loch of Myrton (ibid [table 6.1](#)) as well as from Dorman's Island in Whitefield Loch, again hinting that these sites may not have been in use in the intervening centuries. The reasons for this emerging pattern are unclear, and there is still too little data relating to the construction environment of the dated sites to be certain about the role of environmental factors. Does the lack of dates in the 'blank' centuries relate to a genuine hiatus in crannog construction or to environmental factors, which might either have determined the availability of natural promontories and islets onto which wetland settlements were built at these times or have rendered them high and dry in later periods, meaning that waterlogged material did not survive? Given the difficulties in interpreting those radiocarbon dates that fall in the period 800–400 cal BC this is a hypothetical model but one that is capable of being tested through the greater application of dendrochronology and wiggle-match dating to crannog sites (see [Chap 2b](#)), particularly if it can be carried out in conjunction with high-resolution environmental studies of the type carried out at Lough Kinale in the Irish midlands (Brown *et al* 2005; Selby *et al* 2010).

Episodic occupation of relatively short duration has also been observed at the Early Historic crannog at Buiston, Ayrshire, the only other Scottish crannog to be the subject of intensive dendro-dating (Crone 2000, 110), which leads one to suspect that this may have been the norm rather than the exception. That crannogs were not occupied for any great length of time is also consistent with the evidence from many other wetland sites throughout Europe (see [Chap 2b](#)), while seasonal use of such sites might be anticipated given the unpleasant conditions that must almost certainly have arisen at particular times during the year.

Episodic use on both a centurial and annual basis must necessarily have an impact on our interpretation of the form and function of these sites. In discussing the Lough Gara crannogs in Ireland Fredengren (2002, 280–283) talks about 'shifting perceptions over time', how the crannog/s will not always have had the same meaning or significance to the communities living around them. This seems something of a truism on a millennial scale but nonetheless, if there are episodes of use separated by as much as two to three centuries, as we can now

demonstrate at Cults Loch 3, why should the form and function of these structures necessarily remain the same? If the crannogs were not occupied continuously throughout the year the inhabitants must have lived somewhere else and thus their relationship with other sites in the surrounding area is critical. For instance, the re-use of timbers in the refurbished floors surfaces in ST1, the earliest building on the crannog, implies that there were buildings on the shore from which these timbers came. The results from the Cults Loch landscape project suggest that seasonal or at least fleeting and intermittent occupancy of all earlier Iron Age settlement may have been the norm rather than the exception, though we are always hampered by our inability to detect such fine chronology on dryland settlements. The possibility of transhumance in Iron Age agricultural practice is an avenue that warrants further research, with potentially far-reaching implications for the relationship of settlements with their environs. It is interesting, for example, that no evidence of animals being kept on site was recovered which, with the numerous grain working implements and the votive ard offering, strongly implies that the site was used in conjunction with arable farming of nearby land.

Form

The crannog lay close to the shore to which it was connected via a causeway. It consisted of an enclosed area within which there was at least one building at any one time, and possibly more, and around which there were open spaces. In other words Cults Loch 3 was an enclosed settlement, or homestead, in contrast to the single large roundhouse plan envisaged for many other crannogs, in which the roundhouse occupied virtually the entire footprint of the crannog.

Cavers (2012) has charted the evolution of the single large roundhouse as the crannog stereotype, from Munro's proposal for a large pagoda-like structure at Buiston, via Piggott's interpretation of Milton Loch 1, to Dixon's reconstruction of Oakbank crannog in Loch Tay. Aided and abetted by many artistic representations the single large roundhouse has become fixed in the archaeological literature as stereotypical of crannog buildings (see for example Hingley 1992, 27, 28). Some later prehistoric crannogs may well have consisted of a single large roundhouse; Cavers (2012, 176–179) has made a strong case for such at Dumbuck and Lochan Dughail, and supports Piggott's interpretation of Milton Loch 1 (although an alternative interpretation is considered in [Chapter 2f](#), this volume), seeing such buildings as the timber equivalents of the stone-built island Atlantic roundhouses of

Argyll and the Outer Hebrides (Cavers 2010, 33–34).

However, this overarching stereotype had already been challenged by the late 20th century excavations at Buiston which demonstrated that the Early Historic crannog was more of a homestead than pagoda, the settlement consisting of a slightly-built roundhouse set within the enclosed area, possibly with other small ancillary buildings (Crone 2000). Cults Loch 3 conclusively demonstrates that the crannog as homestead was a variant which was also current in the mid-1st millennium BC. Other later prehistoric crannogs in Galloway may also be homesteads; antiquarian investigations at Barhapple Loch (Wilson 1882; Munro 1882, 182–190) suggest that there were at least two buildings, each with hearths, within an enclosure defined by a stockade some 53×38 m across, while in the Black Loch of Myrton Maxwell recorded ‘eight or nine mounds’ lying on a stake-defined islet roughly 43 m in diameter (Munro 1885, 83). Recent work there has shown that at least one of the mounds is a building with a stone-built hearth at its centre and that this was a lochside settlement rather than a true crannog (Crone & Cavers 2013).

If we accept that Milton Loch 1 consisted of a single large building then there is evidence in SW Scotland that later prehistoric crannogs supported at least two forms of settlement, the homestead and the substantial roundhouse. These two settlement forms might be taken to imply significant differences in social organisation, the productive, functional homestead crannog where there are open spaces and ancillary buildings for food processing and craftworking, versus the non-productive, non-functional substantial roundhouse crannog where most productive activities would have had to take place off the crannog. This could imply social differentiation, albeit that this is not visible in the artefact and ecofact assemblages so far studied, or perhaps differences in the perceived security of the occupants, since occupants of a single-roundhouse type crannog would presumably have had to use an associated area on the shore for such practical activities.

The recognition that crannog houses may not have been substantial or monumental in character in and of themselves (discussed in [Chap 2f](#)) perhaps leads to the requirement for a more fluid definition of domestic monumentality than is sometimes allowed in discussions of Iron Age architecture. While the buildings themselves may have been relatively flimsy and transient, the investment of labour in the construction of the mound itself, in a location totally unsuited to building, must have carried weight as a symbol of presence and authority in the landscape. Thus, crannogs of the type investigated at

Cults Loch may be considered alongside the ‘substantial’ roundhouses of early Iron Age Scotland, albeit that their monumentality (sensu Armit 1997) resides in the physical imprint they create on the landscape. This sense of signifying presence through display of architectural skill, and through the physical occupation of a powerful place – the interface between dry land and water – aligns crannogs closely with the mentality of other earlier Iron Age structures, which are often concerned with outward impressions. It is perhaps no coincidence, furthermore, that the 5th/4th centuries BC appears to be when many forts and defended enclosures across southern Scotland enter a particularly monumental phase, implying an overriding concern with emphasising the impression of settlements on the landscape (see discussion by Armit and Mackenzie 2013, 496).

Functionality; or reasons for living out on the water

People must have lived on the crannog; there are roundhouses and the artefact and ecofact assemblages conform to a general model of Iron Age domesticity. They cultivated crops, processed and consumed cereals and meat, and presumably also engaged in animal husbandry, although there is no direct evidence for that. Craftworking activities involved the manufacture and use of flint tools and stone pounders, possibly for the processing and dyeing of hides, and the manufacture of shale bracelets. There is no evidence that any ‘special’ activity took place on the crannog.

The one element of the artefact assemblage that distinguishes the crannog from the terrestrial settlement sites around the loch and further afield are the wooden objects deliberately buried beneath the floors of the buildings, but this may simply be a question of survival. The presence of the ard share below the floor at Milton Loch 1 and the ard at Oakbank suggest that the deposition of symbolic objects was certainly a practice common to crannog-dwellers, but how extensive was this practice amongst the later prehistoric community? In some roundhouses stone artefacts, predominantly querns which have been incorporated in the paving of ring-ditches, in walls and as packing in postholes, have been interpreted as foundation deposits, as have the few metal tools found within walls (Pope 2003, 179–180; [Appendix 4](#)). However, such deposits were present in only 4% of the 1178 roundhouses studied by Pope (ibid 202), so either the deposition of symbolic objects prior to and during construction was not a widespread practice in the later prehistoric period or it was more

commonplace to use organic objects, of wood, bone and plant materials which have not survived on these dryland sites. If we assume the latter as more likely then there is no evidence which can be distinguished in the physical record that those living on the crannog had a different social identity from those living on dry land. They ate the same foods, carried out the same range of activities, at least those which leave a physical trace, and built similar structures, albeit adapted for conditions on the crannog.

In discussing the lake settlements of the European circum-Alpine region Ebersbach (2013, 283) has argued that ‘... they do not belong to a special culture or to a special set of people set apart from dryland communities’; rather they are ‘... nothing more than special preservation events ...’ (ibid 298). If this is the also the case with Cults Loch 3, as the physical record would suggest, why then did some members of the community choose to live out on the loch? Many functional explanations have been proffered, mostly untestable, but nonetheless they are worth exploring in the context of Cults Loch 3, if only ‘... to secure a clearer view of the less tangible but no less important human criteria in locational decisions ..’ as Morrison (1985, 59) so aptly expressed it.

Defence immediately springs to mind, yet at Cults Loch 3 there is no evidence for the robust palisaded perimeter seen on some of the Early Historic crannogs, Lagore (Hencken 1950, 44–5), Buiston and Lochlee (Crone 2000, 106). At most there may have been a wattle wall encircling the crannog ([Chap 2f](#) & see Frontispiece). Furthermore, the crannog lies no more than 18 m from the shore, a distance which would not have kept it safe from a concerted effort to attack it, and it is also overlooked by the higher ground on which the promontory fort is positioned ([Illus 4](#) & see Frontispiece). The absence of evidence for livestock on the crannog also suggests that security and defence were not issues for the inhabitants in that they must have felt confident enough to leave their herds on the shore. The later Cults Loch 1 crannog out in the middle of the loch is more appropriately positioned for a defensive strategy, while creating an impression of defensibility may have been more the purpose at Cults Loch 3 (Cavers 2010, 171, and see below). Nonetheless, it would have been relatively easy to control access to Cults Loch 3 so it could feasibly have been constructed to provide a safe, secure living environment for members of the community considered ‘untouchable’ and who perhaps needed to be isolated at particular times, menstruating women or foster children, for example.

The settlement may have been built out in the loch for economic

reasons, to free up land on the shore for cultivation. A survey of the crannogs in Loch Awe showed that 17 of the 20 crannogs in the loch lay adjacent to land with arable potential (Morrison 1985, 74) and in a landscape where arable land was available only in small pockets it may have made sense to position the settlement in the water rather than take up valuable cultivable land. However, Cults Loch lies within an extensive landscape of cultivable land and the location of a small settlement on this land is unlikely to have had much impact on agricultural production, particularly as the landscape seems to have been relatively sparsely settled (see below).

Access to transport routes and to different biotopes for exploitation have been cited as some of the advantages of lakeshore settlement on larger water bodies such as the Alpine lakes (Ebersbach 2013, 285), and such considerations may explain, *inter alia*, the string of crannogs along the shores of the longer Highland lochs such as Loch Awe and Loch Tay (Morrison 1985, 59). However, Cults Loch is small; it is possible to walk around it within an hour and it would have been easy to exploit its resources from the shore. There would thus have been no practical reason why building out on the loch would have made it easier to exploit the resources there. Also, suitable structures could more easily have been built on the shore, which would not have required as much investment of energy and materials. It is the size and position of the loch within the landscape, more than anything else perhaps, that suggests that a non-functional explanation for building out on the water is needed.

The loch is an integral element of the landscape; it is not marginal like many other wetlands, isolated from settlement by distance and attendant perceptions of wilderness (as for instance many bogs and mires – cf Van der Noort & O’Sullivan 2006, [chap 2](#)). It was, and still is, part of a ‘taskscape’ (*ibid*), a resource base for fishing and fowling, for the harvesting of sedges, rushes and peat (see [Chap 8](#)), and essential for the watering of livestock. However, at certain periods in the past (and we shall return to the duration of that ‘period’ because it bears on all interpretations) the loch may have been perceived and consequently used differently. Water, or watery contexts seem to have been particularly venerated in later prehistory, attested by the votive deposition of metalwork and human body parts, a practice widespread throughout the British Isles (Bradley 1990), with very local examples of metalwork deposition in the lochs at both Dowalton and Carlingwark (for summary see Cavers 2010, 47–50). The cosmological scheme proposed to explain this pattern of deposition is that water represented the entrance into the otherworld, the world of the dead,

the deities of which needed to be appeased with offerings (Green 1997). Some bodies of water, be they lochs, rivers or small pools in bogs thus became liminal zones, where rituals of transition were enacted. Thus, while the loch continued as a resource base it may also have taken on an additional significance, as a ritually-charged component of the landscape, a process described by Van der Noort and O'Sullivan (2006, 43) as 'enculturing nature'. This is a process which may have begun earlier in the 1st millennium BC at Cults Loch, with the development of Cults Loch 4 and the creation of the steep scarp fronting out into the loch ([Chap 3](#)).

This is the context for the thesis that crannogs reflect the merging of the sacred and the profane that was so prevalent in later prehistoric society, when belief systems were enacted privately within the domestic space rather than communally (Cavers 2006; 2010, 170–171; 2012, 184; Bradley 1998, 181–184). Building a crannog in a loch could be seen as 'domesticating' a ritually significant environment, combining the spiritual and practical spheres of life. However, the numbers of crannogs throughout SW Scotland is unlikely to account for the entire population so it would appear that only certain groups moved out onto the loch; were these priestly groups perhaps, chosen to mediate between the sacred and profane on behalf of the rest of the community? If so, there was nothing in their physical imprint to distinguish them from the community they served. Or was the crannog a communal property, used by the community as a liminal space where transformative rites associated with birth, death and adulthood could be enacted, where going out onto the crannog involved passing over the threshold into the otherworld? Again, there is no physical evidence at Cults Loch to substantiate this thesis.

Brown (2003, 3) has suggested that the advantage, and attraction, of natural islands in rivers and lakes, is that they may be unowned, free of proprietorial, familial or other claims, and this may have applied even more so to man-made islands. The crannog may have been built by a group of people wanting to construct and negotiate a new and distinct social identity (Van der Noort & O'Sullivan 2006, 66) and the only means available to them was by moving out onto the water. However, this implies a social group who are disenfranchised, with no leverage in society, and this is at odds with the physical evidence which suggests that the group had access to considerable resources in terms of manpower and building materials. An alternative view is that this was a resourceful group making a statement about their social identity by building out on the water, taking over unowned space, whose motivation for building the crannog was to

create a sense of exclusivity while simultaneously establishing presence, in other words to create social distance (Cavers 2010, 169). By physically occupying what was considered to be sacred or 'special' space, the separation of the settlement was emphasised, perhaps with an associated heightening of respect for the occupants. In an Irish context, Fredengren *et al* (2010, 250–251) have considered the construction of crannogs on the liminal zones (lochs) away from established settlement nodes as a deliberate subversion of the established arrangement, although it is notable that the early Iron Age is precisely when crannogs become much less prevalent in the settlement record in both Lough Gara and Kinale.

Increasingly, the mid-1st millennium BC recurs as the point at which settlements appear to be concerned with creating a conspicuous imprint on the landscape. It has been identified as an 'event horizon' after which crannogs appear to be constructed in large numbers (Cavers 2006). Elsewhere, Armit has argued for the use of broch towers as symbols employed by local groups to demonstrate their authority in the competitive local landscapes of the Western and Northern Isles (Armit 2002), while the most recent dating evidence pushes the origins of their construction back into the third quarter of the 1st millennium BC (Dockrill *et al* 2006, 105). Similarly, the fort at Broxmouth entered a new and monumental phase around the 5th/4th century BC, a development that Armit and McKenzie consider to represent a conspicuous attempt to impose the significance of the site on the landscape (2013, 496–7). Repeatedly, the 5th/4th century emerges as a watershed in the appearance of settlement architecture designed to impose a presence on the landscape, with the simultaneous implication of an insecure and volatile society.

As Cults Loch 3 demonstrates, this development may have involved relatively minor changes in the architecture of individual buildings, but the requirement for an exclusive settlement, capable of accommodating only a small number of occupants may have been an overriding concern at this time. The associated evidence for private rituals oriented towards the house, seen in the sub-floor deposits at Cults Loch 3, Milton Loch 1 and Oakbank, might likewise point towards a fragmentation in communal identity and the development of a more competitive, introverted and paranoid society. The reasons for this pattern can only be speculated upon at this stage (but see discussion of environmental change below), but the preference for such isolated and exclusive settlements seems unlikely to reflect peaceful, prosperous times, and it is interesting that the votive deposits from the crannogs can be interpreted as a plea for

agricultural productivity (see Hingley 1992, 38; Bradley 2005, 56). It is possible, then, that at Cults Loch 3 there is evidence for the commencement of the lake settlement tradition in Scotland, a local response to a new requirement for physically imposing, outwardly defensive settlements that in the north and west took the form of monumental roundhouses and in the south and east of Scotland appeared as massively-defended enclosures.

In summary, the construction of Cults Loch 3 on the edge of a small kettlehole loch cannot be explained in purely functional terms, such as defence, access to resources or transport routes, and so we must look to less tangible motives, perhaps originating in the belief systems and/or the social order of the community, which placed significance on the water body as a locus for settlement and other activities. Environmental change and climatic instability have also been proposed as stimuli for lacustrine settlement (Baillie & Brown 2009; Crone 2012, 164) and such conditions might well create the insecure, paranoid society depicted above, but there is almost certainly no monocausal explanation. For instance, Magny (2004) has demonstrated that, while there is a clear relationship between dry periods of low water and intensive development of wetland sites around the Alps, there were also periods of lower lake levels with no settlement. He has also shown that during wetter periods settlement contracts north of the Alps but increases south of the Alps (Magny 2013, 592–593), so environment alone cannot be the determining factor and other socio-cultural stimuli must be considered (see also Petrequin 2013).

Whatever the rationale behind it, living out on the water was clearly a later prehistoric phenomenon, with 37 of the 52 dated crannogs falling within the period between c 850 cal BC and cal AD 200 (Crone 2012, 147). When archaeologists discuss belief systems or social organisation we tend to think in terms of millennia for their evolution and implementation, the ‘water-cult of the later prehistoric period’, for instance. Yet the short duration of activity on Cults Loch 3, maybe not much more than a half-century, suggests that the crannog was not the outcome of communal traditions, evolved and enacted out over centuries, but may have been more of a local response to a prevailing ethos which did not last long. What is certain is that the crannog-building phenomenon did not disappear entirely, however, as similar structures were built in the middle and later Iron Age, so that it is possible that crannog building may have been a response to particular socio-cultural or economic conditions, perhaps as a direct response to periods of stress and insecurity. By allying the

settlement with established powerful forces, it is possible that the occupants were attempting to secure the survival of the group in the face of a direct threat beyond their physical control, such as disease, crop failure or climatic extremes.

9B THE SITES IN THEIR LOCAL AND NATIONAL CONTEXT; THE LATER PREHISTORIC SETTLEMENT RECORD OF WIGTOWNSHIRE

Settlement development in the 1st millennium BC in southern Scotland

The results of the Cults Loch Landscape project offer a new insight into the development of Iron Age settlement arrangements in southern Scotland. The evidence recovered from Cults Loch relates to the earlier Iron Age, a key phase in the development of prehistoric settlement patterns in northern Britain generally, and it has the potential to inform our view of landscape development throughout the 1st millennium BC. In order to place this data within its regional and national context, it is necessary to consider the nature of settlement development prior to the changes that occur in the mid-1st millennium BC.

Settlement remains dating to the earlier 1st millennium BC in SW Scotland are typical of those found widely across Scotland, with extensive hut-circles and associated cairn and bank field systems found widely in the Galloway uplands (eg Yates 1984). Typically, Bronze Age hutcircle settlements are found extensively in upland areas of the Galloway hills marginal to modern agriculture. Generally in the region of 5 m to 12 m in diameter, the Galloway examples are typically situated on south-facing slopes and comprise earth and stone banks, occasionally displaying signs of the elaboration of the entrance area. While frequently associated with enclosures and narrowrig field systems, settlement prior to the middle or later 2nd millennium seems largely to have been unenclosed. Excavations at sites such as Green Knowe (Jobey 1980) and Lintshie Burn, Lanarkshire (Terry 1995) indicate that unenclosed platform settlements were a feature of the uplands in southern Scotland from the mid to late 2nd millennium BC, while unenclosed hut-circle landscapes studied on Arran and at Achany Glen, Lairg, show that occupation in those upland regions peaked before 1000 BC, though indications of the continuation of agricultural activity persist well into the 1st millennium BC (Barber 1997; McCullagh & Tipping 1998).

The significance of upland settlement in the later Bronze Age is

typically discussed with reference to the impact on the environmental record, with upland areas well suited to programmes of palaeoenvironmental sampling and palynological analysis. These analyses, coupled with critical assessment of patterns of survival and detectability of earlier 1st millennium settlement have raised the issue of population levels, duration of settlement and the possibility of seasonal or intermittent use of upland settlement areas. The abandonment of upland areas during an apparently dramatic episode around 1000 BC unquestionably accounts for the problematic disappearance of the late Bronze Age from the settlement record in SW Scotland (Gregory 2002, 70), with the concurrent intensification in more favourable zones resulting in the repeated and ongoing process of 'overwriting' earlier phases of settlement. Indeed, Halliday has even suggested that, contrary to a postulated catastrophic decline in population in the early centuries of the 1st millennium BC (cf Burgess 1985), relict hut-circle landscapes of the late 2nd and early 1st millennium BC may rather be seen as evidence of a growing population that could no longer be supported by farming in the lowlands alone (Halliday 1999, 62). In either case, it is clear that the apparent dominance of the uplands in our understanding of the 2nd millennium BC in Scotland is simply an artefact of archaeological interest in well preserved hut-circle landscapes in these areas. What is apparent, however, is that those zones of the most intense settlement and agriculture occupied in the final centuries of the Bronze Age in Scotland were effectively those that form the extents of Iron Age settlement in its entirety; landscape studies such as those undertaken at Forest Road, Kintore demonstrate a pattern of continuity and development that is common across all lowland areas of Scotland (Cook & Dunbar 2008).

Local palynological studies have identified the increase in detectable agriculture on mid- and lower-level slopes in the period 3500–2500 cal BP, immediately followed by a marked decline in cereal grains and charcoal around the Bronze Age – Iron Age transition (Flitcroft 2006) that accords well with the wider patterns detected throughout southern Scotland. On the whole, the impression is of limited and stable proportions of land being cultivated in the period after c 1800 BC (Tipping 1997, 20) prior to the widespread and 'wholesale' clearances of lowland zones in the second half of the 1st millennium BC (eg Dumayne 1993; Tipping 1994). Local patterns vary, but it is apparent that some areas were virtually treeless well before the end of the millennium, so that the intensification of settlement in lowland areas like the Luce isthmus in the period after

500 BC might be seen in the context of a 'coalescence' of settlement around parcels of the most agriculturally productive ground.

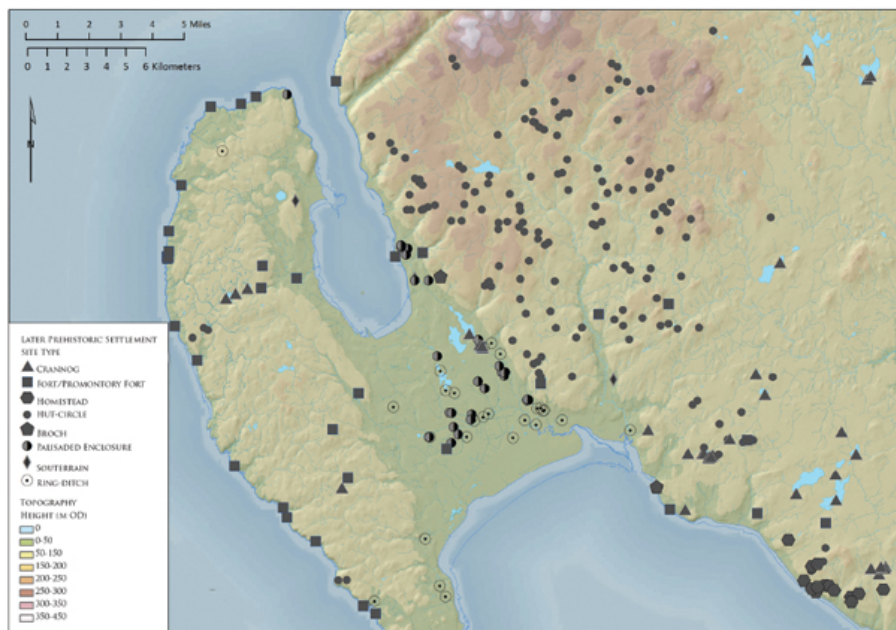
The earlier Iron Age settlement landscape in SW Scotland

From the Late Bronze Age, the lowlands of southern Scotland were populated by enclosed and defended settlements in a formation that makes the distinction of later Iron Age settlements from those of the earlier 1st millennium BC extremely difficult. Upland regions were clearly not abandoned wholesale in the 1st millennium BC, as the post-defensive and unenclosed phases of many southern settlements (eg RCAHMS 1997, 152–154; 1967, 29) and isolated stone-floored roundhouses such as Moss Raploch (Condry & Ansell 1978) clearly indicate, but the concentration of Iron Age sites in the lowlands is clear. From the early 1st millennium BC onwards, however, the heterogeneity in the Iron Age settlement record of SW Scotland becomes increasingly difficult to deal with. The lack of archaeological research in recent decades means that excavated sites are few and far between, and well understood sites of this period even less so. The settlement record is remarkably varied in comparison with other areas of Scotland (Illus 176); it has been suggested that this variability and lack of distinctive identity are partly the reason for the apparent anonymity of SW Scotland in Iron Age studies (Cowley 2000, 168; Haselgrove *et al* 2001).

Forts and other defended enclosures are numerous across Dumfries and Galloway, though it has been noted in several regional syntheses that these tend to be smaller and more often stone-built than in other parts of southern Scotland (eg Feachem 1956; Cowley 2000). While broadly similar in morphology to the general morass of later prehistoric enclosures of southern Scotland and northern England, Wigtownshire forts nonetheless possess distinctive characteristics; most are under a hectare in area and many make use of natural or enhanced scarps rather than formal ramparts. Although multivallate forts are represented west of the Dee, examples including Barnkirk Hill (Feachem 1956, 9) and Cairn Pat (RCAHMS 1985, 14), they are very much in the minority and the constructional characteristics of some, such as the possible complex wall at Fell of Barhullion mean that direct comparison with better-known forts of south eastern Scotland may not be straightforward, with consequent implications for their date of construction.

The proliferation of ditched and palisaded enclosures detected, for the most part, through aerial photography (Cowley & Brophy 2001)

tends to be ascribed to the mid-1st millennium BC, though the issues with radiocarbon dating earlier Iron Age material mean that the conventionally accepted date for their appearance tends to be spread across the second and third quarters of the millennium (Hunter & Carruthers 2012, 78). There is remarkable homogeneity in the examples detected in Wigtownshire, with the standard form of single ditch and inner palisade common to examples ranging in diameter from around 30 m to 60 m internally ([illus 177](#)). Halliday has recently questioned the security of date samples for many palisaded settlements, following Sharples (2010) in a critique of the date of primary enclosure at Standingstone in East Lothian (Haselgrove 2009) and preferring to envisage later Bronze Age settlement as predominantly unenclosed prior to a later 1st millennium BC enclosure phase (Halliday forthcoming). In the case of the palisaded settlement at Aird Quarry (Cook 2006), Halliday has also postulated the effect of residual dates deriving from a funerary use of the site prior to the first domestic enclosure (*ibid*); he suggests a later 1st millennium BC origin for the latter, in part derived from the probability that at least one of the roundhouses on the site was of the double entranced type, a variant which might be expected to fall at the later end of the 1st millennium BC. Despite the recognition that palisades as a structural form carry little chronological significance there is still an implicit view that palisaded enclosures represent ‘founding’ settlements, with developed ramparts only following on longer-lived sites (see Harding 2000b). Indeed, the term ‘palisaded enclosure’ can be misleading, since in many instances the palisade slot may have been integral to an enclosing rampart, in either an earthen or timber ‘box’ rampart arrangement (see discussion in [Chap 4](#), above; Ralston 2006, 46–49), and it certainly seems that the ditch and bank of Cults Loch 5 belong to the primary phase, along with the palisade.

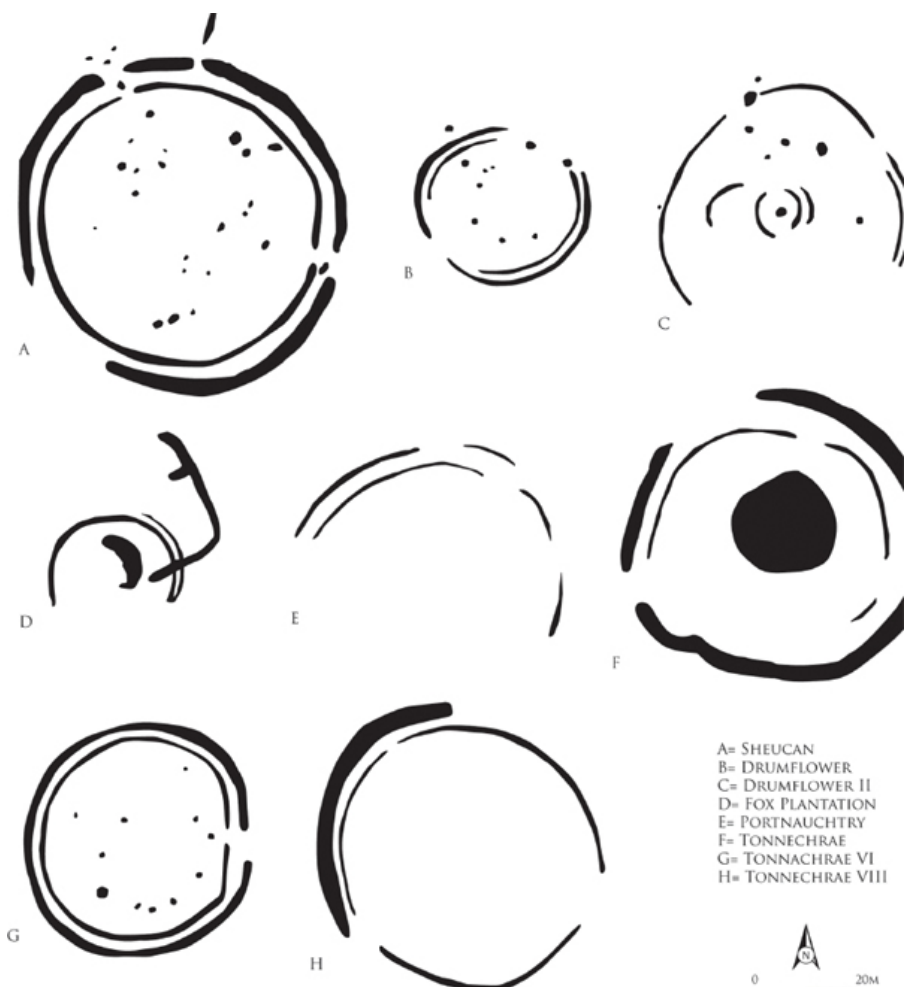


Illus 176. Distribution of later prehistoric sites around the Stranraer isthmus

The aerial photographic ‘honey pot’ of the Luce isthmus has been particularly productive in the identification of enclosed sites of this period, and new discoveries continue to be made. The uncertainties over the date of many of these enclosures accepted, the impression is very much of the coalescence of the settled landscape into a series of nodal locations that were sustained over a considerable time span. The cropmark record demonstrates that the rebuild of roundhouses over the footprint of earlier buildings was common: at Garphar on the River Stinchar near Ballantrae (NX18SW 26), no less than three phases of roundhouse construction are visible overlying primary and secondary palisades, with at least five buildings visible, some accompanied by probable souterrains (Cowley & Brophy 2001, 65).

While always working within the bounds of a limited excavated dataset, the impression from the cropmark and upstanding enclosure record is of relatively little change in settlement configuration over the course of several centuries from the mid to later 1st millennium BC. A few exceptional site types are represented in the region, including brochs at Ardwell (MacKie 2007, 1325), Stairhaven (Yates 1983) and Teroy (Curle 1912), and a spread of rectilinear enclosures which were probably less common than further east. While the brochs have produced artefacts that might lend weight to the traditional view of late dating of southern Scottish Atlantic roundhouses (see Mackie 2007, 1326; McLaren & Hunter, this volume [Chap 7](#)) and the double-entranced form at Ardwell might support such a date at that site, the

alignment of Galloway with the Atlantic seaboard of Scotland (Henderson 2007a) has prompted some to question whether there is an a priori reason why the Galloway brochs should be late in the Atlantic sequence (eg Cavers 2008, 16). Other settlement types, such as the duns at Crammag Head, Killantringan Bay and the stone 'ring-fort' style homesteads of the Machars (Cavers & Geddes 2008) may betray an affinity to Atlantic parts of Scotland that is masked by the timberbuilt component of the settlement record, an impression that is heightened if crannogs and island settlements are likewise seen as a typical feature of the western Scottish spectrum. Characterising SW Scotland as more 'Atlantic' in style than is often recognised has implications for the date of each type: with the origins of the Atlantic roundhouse now accepted to be at least as early as the third quarter of the millennium (eg Dockrill *et al* 2006, 104) and the widespread recognition that massive stone roundhouses are generally used over very large periods of time, it seems at least plausible that the Galloway brochs appeared prior to the Roman centuries (Hunter & Carruthers 2012, 56).



Illus 177. Ditched and palisaded enclosures

Rectilinear enclosures appear to be a genuine component of the later 1st millennium BC settlement record, and while they do not perhaps appear in the numbers identified in East Lothian (Cowley 2009b, 212–7), the experience gained from investigation of Rispsain Camp (Haggarty & Haggarty 1983) must surely raise the probability that some of the rectilinear earthworks classed as medieval moats, like Monreith Mains (Feachem 1956, 64), should be considered likely to have Iron Age origins. Taking Rispsain Camp and the cropmarks at Cairn Connel Hill as an indicator, the frequency with which these enclosures contain double-entranced ring-grooves would support their dating towards the later end of the 1st millennium BC and into the Roman period in southwestern areas, as elsewhere (Cowley *op cit*).

The heterogeneity for which the Iron Age of Wigtownshire is known presents something of a challenge for interpretation. The pitfalls of

searching for comparanda from elsewhere may often lead to misleading assumptions of date and function, and too little excavated evidence exists to rely on outside models too completely; we need only look at the data from this project, which has contributed to a reversal in the accepted wisdom over the date of southern souterrains (Chap 4) for illustration of the difficulties. As research in the area increases, the impression is given that SW Scotland needs to be understood on its own terms, with new models for settlement development and function through the later 1st millennium BC.

The Cults Loch landscape: settlement duration and evolution 500–0 BC

The programme of excavation undertaken at Cults Loch significantly clarifies the picture of earlier Iron Age settlement in SW Scotland. From the unsorted mass of enclosed and unenclosed roundhouse settlements which, as a group, span in date from the start of the 1st millennium BC to the later 1st millennium AD, we have a glimpse of the dynamics of settlement, abandonment and reoccupation within the confines of a single agricultural unit and, as a consequence, can make some informed judgement on the chronological relationship between the excavated sites and the duration of their use.

Prior to commencing fieldwork at Cults Loch, two possibilities presented themselves as explanation for the patterns seen in the settlement record of the area. Firstly, it was possible that the arrangement of enclosures, crannogs and settlements beside lochs represented a dense distribution of broadly contemporary farmsteads, comprising the various settlements of a farming community in the centuries of the later 1st millennium BC. On the other hand, it was possible that the Cults Loch settlement sequence represented the development of a relatively small local community, which underwent dramatic changes in settlement arrangements over the course of several centuries. While the archaeologist's instinct to see change and development in apparently static arrangements might have been expected to lead to the preference for the view of non-contemporaneity of the settlements in this area, the presumption of longevity of use of Iron Age settlements meant that either hypothesis could have been contemplated based on precedent in a Scottish context. In many instances, the perceived lack of chronological resolution in settlement patterns is directly attributable to the insufficiently critical use of radiocarbon dates (Haselgrove *et al* 2001, 2–5), but nonetheless Iron Age studies in Scotland have lacked the

structure with which to be able to refine an understanding of settlement dynamics and interrelationships in the 1st millennium BC. The issue of duration of use of later prehistoric settlements has in recent years begun to surface as a matter of key importance. A series of papers presented in the early 2000s highlighted the severe limitations of our understanding of the mechanics of the archaeology of use and abandonment (Barber & Crone 2001; Cowley 2001), while Halliday considered the implications of very short durations of occupation of later Bronze Age hut circles for population levels and the significance of apparently very extensive settlements like that at Achany Glen, Lairg (McCullagh & Tipping 1998; Halliday 1999). At Forest Road, Kintore, the excavators used a crude estimate of roundhouse duration based on figures suggested by Barber and Crone (2001) and the evidence for repair and refurbishment of individual timber roundhouses to demonstrate a progression of house building and settlement evolution over time (Cook & Dunbar 2008). The effect was to refine the general morass of Bronze and Iron Age buildings on the site, the use of which occurred within radiocarbon centuries, into a settlement that evolved and changed rapidly, on a scale of decades.

Hamilton's discussion of the modelled radiocarbon dates for the three sites excavated at Cults Loch ([Chap 6](#)) enables a much clearer analysis of the settlement pattern around the loch in the mid-1st millennium BC. The sites yielded broadly similar radiocarbon dates, but several interpretive scenarios for the middle of the 1st millennium BC may be considered, and each must be discussed in light of the physical evidence recovered. As far as the dated elements of each site can determine, Cults Loch 5, the palisaded enclosure, was certainly occupied first, before the mid-6th century BC. It is statistically possible that all three sites (encompassing Phase 1 at Cults Loch 5) were occupied contemporaneously, with the shared overlap in occupation start/end dates falling in the range 535–380 cal BC at 95% probability, or in the range 520–450 cal BC at 68% probability. However, within the ranges of uncertainty, it is also possible that the sites were sequential in their use, with Cults Loch 5 occupied first, before the mid-6th century BC, followed by activity at Cults Loch 3 in the later 5th century, with activity at Cults Loch 4 falling latest in this hypothetical sequence around the turn of the 5th/4th century BC. A third possible scenario offers the possibility that Cults Loch 5 was the first settlement in the sequence, was abandoned and Cults Loch 3 and Cults Loch 4 occupied together thereafter, with a return to Cults Loch 5 in the last two centuries of the 1st millennium BC.

Consideration of the excavated evidence and the wider

archaeological context can allow us to refine the statistical possibilities further, however. Key to the model is the significance of the results of the excavations at Cults Loch 3, which demonstrates that activity on the crannog took place over little more than a half-century, with the bulk of activity concentrated in the second half of the 5th century BC. The dendrochronological results indicate that building activity was spread over several decades, the relative alder chronology indicating that, for example, ST2 was probably constructed around 30 years after the construction of the sub-structural crannog mound, while the oak sequence indicates that pinning stakes were added to the site, perhaps to refurbish and strengthen the platform in the years subsequent to its initial construction. All of the evidence points to the relatively short-lived duration of individual buildings and most likely to the sequential use of structures across the site. If we can demonstrate that one site was only occupied for a half-century then we must accept that the others might only have been occupied for a similarly short period and that they might not have been contemporary at all. At Cults Loch 5 the phases of house building are separated by centuries but the duration of those phases may have been no longer than a half-century.

The duration of occupation of Iron Age enclosures in the Scottish lowlands is an issue that is under constant review, but increasingly the evidence favours the view of highly episodic and intermittent occupation, with repeated reuse and abandonment the norm rather than the exception. Most recently, Ellis's consideration of the patterns of occupation and abandonment of the structures at Braehead, combined with analysis of micromorphological analysis of the ditch fills has pointed to the highly episodic use of the enclosure. The excavator raised the possibility that the Braehead enclosure may even have been used seasonally, with evidence for the regular flooding of the perimeter ditches and surrounding landscape (Ellis 2007, 257), while the lack of quern stones and other heavy stone tools also suggested that the site was used on a seasonal or intermittent basis (McLaren & Hunter 2007, 222–223). While the site may have been used for several generations, the archaeological evidence pointed strongly to the relatively fleeting nature of each episode of use, with total abandonment, perhaps involving the inundation of the site, accounting for fairly radical changes in layout between phases of use.

A major consequence of the identification of short periods of duration in the Cults Loch sequence is the fact that the excavated sites cannot feasibly be taken to represent the full settlement sequence of the local area throughout the mid-late 1st millennium BC. At certain

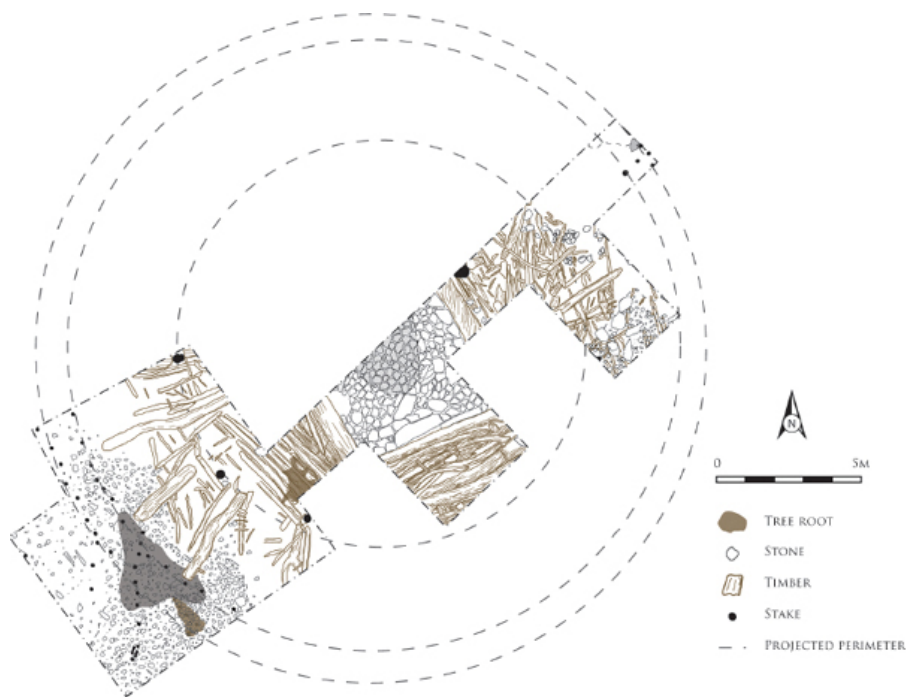
points, all of the sites must have been out of use, which raises the question as to where the local population were settled. Nearby enclosures like Sheucan might account for these gaps, but if defended enclosures like Sheucan and Cults Loch 5 were the principle settlement type, the area occupied by the local group may need to be extended outwards by several miles in order to encompass enough sites to envisage an unbroken settlement sequence. Perhaps more probable is the likelihood of further, undetected settlements, perhaps unenclosed, in the areas around the loch; if the erosive effect of centuries of ploughing demonstrated by the interior of Cults Loch 4 can be taken as typical, the strong probability is that such sites are destroyed or beyond archaeological detection. The consequence for the geography of local settlement is an impression similar to the concept of *Siedlungskammer* (Ebersbach 2013, 294–295), where settlements within a larger territory are dynamic and susceptible to change, while the definition of the territory itself may be highly durable over considerable timespans.

Increasingly, the longevity of use attested on Iron Age settlements in Scotland is understood in terms of punctuated periods of activity, often overwriting earlier phases but not necessarily implying continuity. These patterns of repeated reoccupation, associated with phases of rebuilding and reconfiguration of the associated enclosure are familiar in the settlement record of southern Scotland, with forts like Broxmouth witnessing repeated phases of reconstruction and remodelling, associated with periodic redesign of the enclosing defences (Armit & McKenzie 2013), while similar patterns are recognisable in multi-period settlements like the ‘broch villages’ of Caithness (eg Cavers et al forthcoming). The reuse of the Cults Loch 5 enclosure demonstrates a similar pattern: the settlement must have been recognisable as a feature in the landscape, perhaps as an overgrown bank and partially in-filled ditch, by the time of the reoccupation of the site, maybe two centuries later. The remarkable similarity in the form of the internal buildings in each phase tends to suggest that the arrangement and function of the settlement was similar, so that the settlement form was still relevant and current in the later phase of use, even if the reasons for the original abandonment had been forgotten or become irrelevant.

The issue of repeated and intermittent occupation in turn raises the question of the stimulus for change. As the analysis of dating evidence has demonstrated, both Cults Loch 4 and Cults Loch 5 retained their relevance to the local configuration as settlements, both witnessing multiple phases of reconstruction and reoccupation. The crannog was

almost certainly built and occupied within the chronological span of activity at both the promontory fort and the palisaded settlement, so that the reasons for the construction of the crannog must have been founded on the desire to break with the established arrangements and create a new impression on the landscape. With the caveat that the nature of the occupation of the promontory fort is effectively unknown, the need for a settlement placed within the waters of the loch was apparently more pressing than making use of the heavily defended promontory less than 50 m away.

Cults Loch 3 was initially selected for investigation because of the possibility that the site represented the remains of a lake-side settlement, unique in Scottish archaeology and perhaps related to the late Bronze Age lake-side settlements of Ireland, such as Cullyhanna (Hodges 1958), Lough Eskragh (Collins & Seaby 1960), Clonfinlough (Moloney *et al* 1993) and Knocknalappa O'Sullivan 1998, 85–89). Though the radiocarbon date obtained for the site in 2004 had indicated that the promontory had been occupied somewhat later than the Irish examples, the site was nonetheless at the earlier end of the Scottish lake dwelling chronology, while its physical location suggested that the site was something different to the island settlements found offshore in Scottish lochs. The discovery that Cults Loch 3 is in fact mostly artificial in origin, with the mound constructed on what was probably a peaty promontory in the loch, places the site back into the classification of 'artificial islet', although it is not possible to say precisely what the relationship of the settlement to the shoreline was during its occupation (ie whether open water or marshy ground stood between the settlement and the shoreline). It is possible, therefore, that Cults Loch 3 is a product of the earliest stimulus for crannog construction in Scotland



Illus 178. Black Loch of Myrton; plan of the roundhouse with the massive stone hearth at its centre and the radial structure of the sub-floor timbers exposed

Although Cults Loch 3 was relatively short-lived, the concept of loch settlement was apparently established in SW Scotland from this point on, with the evidence from Dorman's Island (Cavers et al 2011), Cults Loch 1 and Barlockhart Loch demonstrating the survival of the concept into the late 1st millennium BC and into the early 1st millennium AD. As considered above, Crone has recently discussed the patterns apparent in the dating evidence for Scottish crannogs, and considered the possibility that the construction of loch settlements was not continuous through the 1st millennium BC, and that instead dates cluster around several key horizons (Crone 2012). The explanation for these date clusters requires more research, since unlike in the early Iron Age, later crannog constructions are not matched by equivalent dramatic changes in the terrestrial settlement record. It is difficult to avoid the conclusion that Cults Loch 1 represents a 'fully developed' crannog, located in open water some distance from the shore, in a period when artificial island dwellings were a well established concept in the local settlement system.

Architectural forms in the Cults Loch settlements

The evidence for the nature of the superstructural architecture on the crannog is equivocal, and raises important questions about the correspondence of crannog architecture to its dryland counterpart. In this area, evidence recently obtained from a small excavation carried out at Black Loch of Myrton, near Monreith, may help to clarify the form and duration of the Cults Loch 3 structures (Crone & Cavers 2015). At that site, the post ring and sub-floor timbers of a roundhouse c 11m in diameter were found, with a massive central stone hearth (illus 178). Radiocarbon dates from this structure place it in the same early Iron Age horizon as Cults Loch 3 and, although the materials used to construct the inorganic hearth (boulders at Black Loch, timber boxes filled with gravel at Cults Loch 3) there are close similarities in the construction of the buildings. At Black Loch, the structures were built directly over peat meaning that there are no foundation timbers to confuse the footprint of the building as at Cults Loch 3, but the construction of the floor, using corduroy arrangements of roundwoods overlain by brushwood and other organic flooring materials, is similar at both sites. At Cults Loch 3 the refurbishment of the hearths was attested by bands of gravel interspersed by hearth debris, while at Black Loch new layers of boulders capped with large flagstones were added to the hearths at each refurbishment.

The implication of the refurbishment of hearths at both sites is that enough time had passed that the original structure had become dilapidated or needed repair in order to be serviceable. At Black Loch, there was only limited evidence for refurbishment of the timber parts of the building (replacement piles alongside some of the internal post-ring timbers) so this must have happened within the lifespan of a single roundhouse. It is tempting to see this as seasonal use occurring within the decadal-scale use of the roundhouse, with refurbishment of the hearth perhaps part of an annual or bi-annual cycle. The post-excavation analysis of the Black Loch material to explore these issues has not yet been undertaken, and reliable data on the durability of timber buildings in boggy environments needs further research, but the possibilities raised by this evidence are tantalising.

Although the wetland structures at Cults Loch 3 appear to have been relatively lightweight, it is doubtful whether this can be taken as a contrast with contemporary roundhouses found within the enclosed and defended settlements of the area. The two most comparable local structures, the roundhouse within the palisaded enclosure at Aird Quarry (Cook 2006) and Roundhouse A at Cults Loch 5 could be considered equally flimsy, with the ringgroove walls accommodating only light wattle fences. The conventional reconstruction of such

houses provides the building with roof supports located in the central post-ring, while the wicker walls of the structure bear no weight and may only have served as the frame for more substantial daubed walls or as the lining of a turf bank (eg Reynolds 1982). The extrapolation of post sizes from postholes is inherently unreliable, but those within both the Cults Loch 3 and the Aird Quarry roundhouses were relatively small, and need not have accommodated posts much more substantial than those found across the crannog and throughout the footprints of both ST1 and ST2.

The important question is whether the buildings constructed at Cults Loch 3 can be taken as comparable to the structures within enclosed sites such as Cults Loch 5, and well documented in the aerial record across SW Scotland. The problems of interpreting the superstructures aside, on the basis of the artefactual material recovered from the crannog excavation there is no obvious reason to consider the buildings as functionally distinct from the majority of Iron Age houses investigated on terrestrial sites in SW Scotland. In terms of floor area, the Cults Loch 3 structures accord reasonably well with typical roundhouse ranges in southern Scotland: ST1 was probably in the region of 10 m and ST2 in the region of 11 m. Roundhouse A at Site 5 was around 14 m in diameter, though as Toolis has discussed (2007, 297), depending on how the ringgroove articulated with the roundhouse walls and any associated bank the living area may have been somewhat smaller. In any case, the diametrical range for roundhouses dated to the mid to late 1st millennium BC in southern Scotland is generally between around 7 m (in the case of small structures like houses 11 and 12 at Boonies, Jobey 1974, 130) and 15 m (as at Carronbridge, Johnson 1994), comfortably accommodating the ambiguities over the limits of the Cults Loch 3 structures. Leaving aside the question of whether the crannog had any 'special' status in the local landscape (see above), were these buildings to have been located on dry land and had only the inorganic components survived (including, for the sake of argument, postholes instead of posts), there would be little basis for considering these structures as different to the ring-groove houses investigated on other Iron Age sites in southern Scotland.

10 Conclusions

In [Chapter 1](#) the research framework within which the Cults Loch Landscape Project was conceived was presented. The aims and objectives of this framework had been developed in the 2006 SWAP research agenda (Cavers 2006a – and see ScARF 2012a) and it is against these that the key outcomes of the project should be reviewed and measured.

To recap, the SWAP research agenda sought a contextualised landscape approach to wetland archaeology, the overarching aim of which was to integrate the wetland dimension into mainstream archaeological debates. This was in response to criticisms over the last few decades that wetland archaeology had not engaged with these debates, and had failed to contextualise the rich seams of cultural and environmental evidence produced by wetland sites (for summary see Menotti 2012, 20–23). To this end the SWAP research agenda focused on lacustrine settlement and developed a series of research themes which would enable wetland archaeology in Scotland to contribute to a fuller understanding of past societies (Cavers 2006a, 16–18).

Chronology was identified as a key research theme, in particular chronological patterns, the duration of structures, and the resolution of periods of occupancy, abandonment and reuse of wetland settlements. The dendrochronological work at Cults Loch 3 has again focused attention on the short duration of occupation on crannogs, suggesting occupancy of little more than a half-century in the late 5th century BC, followed by abandonment then re-use, probably of a very limited non-domestic nature, in the early 2nd century BC. The detection of episodes of building activity within the main phase of occupation, which might have given us insights into building duration and seasonal use of the site for instance, has proved more problematic because the primary structural timber was alder, a species which does not yield its dendrochronological secrets easily. However, the Bayesian modelling of wigggle-match dated oak and alder timbers, and

individual radiocarbon dates suggests that the buildings were replaced within the span of no more than a generation. The implications for our interpretation of wider settlement patterns are far-reaching (see below).

Another key research theme was the relationship between wetland settlements and their contemporary ‘terrestrial’ counterparts during the later prehistoric centuries. Firstly, the Cults Loch project has demonstrated conclusively that, rather than being marginal, crannogs were a central and integral component of the settlement landscape of the region during later prehistory, and that landscape-wide settlement patterns cannot be fully understood without consideration of the wetlands. Secondly, the Bayesian analysis of the radiocarbon and dendrochronological dates from the excavated sites at Cults Loch has revealed the sequential nature of settlement around the loch. We cannot determine whether it was the same community that built the palisaded enclosure, abandoned it, moved onto the crannog and promontory fort in the 5th century BC and then moved back into the enclosure in the 2nd century BC; they may have moved to the Sheucan enclosure, for instance or other sites buried beneath the airfield on the south side of the loch, while the promontory fort and crannog were developed by another group. We may never approach the level of resolution which is being achieved around the circum-Alpine lakes of France, Switzerland and Germany, where the settlement patterns of specific communities are now being identified (Ebersbach 2013, 295) but what the Cults Loch evidence does imply is that that we need to build a greater degree of community mobility into settlement models for later prehistory in this part of Scotland at least. Moreover, if the crannog was only occupied for two generations at most we should perhaps anticipate the same duration of occupation in the roundhouses of the palisaded enclosure. After all, there is no evidence for repair and replacement of either of the roundhouses. The implication for the settlement record is that of smaller numbers of people moving more frequently around the landscape. In a landscape increasingly constrained by ownership and expanding agriculture the concept of a *Siedlungskammer* might be a useful one to adopt and develop in a Scottish context. Defined as a small area or territory encompassing a number of ecosystems within which settlement is dynamic and unstable, ie the community is moving around at regular intervals, while patterns of resource exploitation, of land, water and woodland etc, remain relatively stable (ibid), *Siedlungskammern* might help to explain the settlement pattern of the Luce isthmus (Illus 176) and beyond.

The Cults Loch project has also addressed another theme of the SWAP agenda, the form, function and meaning of later prehistoric crannogs. It has long been argued that the label 'crannog' masks a heterogeneity of form and function and that if we are to integrate them more fully into regional settlement studies these sites must be better defined. There are still too few excavations of crannogs for the significance of variability in size, construction and design to be fully understood but the work at Cults Loch 3 has contributed substantially to the database for buildings and living conditions on prehistoric crannogs, despite the often very decayed state of the evidence. In particular, the cleanliness of the living spaces is notable, with the floor surfaces being constantly scraped off and replenished, an observation which has implications for understanding the taphonomy of terrestrial sites, particularly the apparent poverty of the artefact assemblages which so characterise the region. We have also gained some insights into the motivation for building out on the water, a key research recommendation of the ScARF Iron Age Panel (ScARF 2012b). A consideration of Cults Loch 3 within its immediate environment has highlighted the non-functional aspects of its location and points to intangible motives, perhaps originating in the belief systems and/or the social order of the community. We have speculated that disturbance to prevailing sociocultural and economic conditions triggered by, or at least enhanced by climate change might have created the circumstances that prompted this very particular response by the community, but in the absence of any firm evidence this must remain speculation.

This brings us to those elements of the Cults Landscape project that have not worked as well as was expected. The peat deposits in the northwestern corner of the loch offered the prospect of an environmental sequence which could be correlated with the archaeological record; it was anticipated that, by revealing the environmental conditions in and around the loch and the nature of the activities taking place, a multi-proxy investigation of the sediments could perhaps throw light on the circumstances that prompted the move out on the loch. Disappointingly, dating has shown that there are no contemporary sediments in this part of the loch, while date inversions in the upper sediments out in the loch meant that it has not been possible to construct a reliable chronological framework for the off-site environmental studies. Viable explanations for the date reversal have been proffered and an age-depth model proposed which, if accepted, allows us to detect the impact of crannog construction and use on the ecology of the loch as well as gross changes in landscape

use within the catchment which are likely contemporary with the crannogs. However, without a reliable chronological framework it has not been possible to interrogate the contemporary sediment record in the detail necessary to complement the more precisely dated on-site activity. This is the second attempt to correlate off-site environmental studies with well-dated crannog deposits, the first being at the Early Historic crannog of Buiston, and it is tempting to speculate whether this sort of study will ever be possible in the small kettlehole lochs which characterise SW Scotland, in which episodes of lowered loch level and subsequent erosion of surrounding peat deposits may have been the norm.

Finally, a major aim of the SWAP initiative has been to raise the public profile of Scotland's wetland archaeology (Cavers 2006a, 29). The involvement of volunteers and schoolchildren in the Cults Loch Landscape Project has engendered an abiding local interest in the wetland archaeology of the region and with the publication of this monograph the authors hope that this interest will be spread further afield.

Bibliography

Abbreviations

BAR	British Archaeological Reports
CBA Res Rep	Council for British Archaeology Research Report
<i>Discovery Excav Scot</i>	<i>Discovery and Excavations in Scotland</i>
Proc Soc Antiq Scot	Proceedings of the Society of Antiquaries of Scotland
Soc Antiq Scot Monog Ser	Society of Antiquaries of Scotland Monograph Series
<i>Trans DGNHAS</i>	<i>Transactions of the Dumfries and Galloway Natural History and Antiquarian Society</i>

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Appendices

Appendix 1. Cults Loch 3; the environmental assemblages

Jackaline Robertson

Methods

Samples were processed in laboratory conditions using a flotation method designed to retrieve both waterlogged and charred macroplant remains (cf Kenward *et al* 1980). A subsample of 0.5–2 kg from each bulk sample was gently disaggregated in water. The sediment mainly consisted of a gravelly sand with small sub-angular stones, which contained large quantities of humic material that did not require any further pre-treatment. The only samples processed in their entirety were the three core samples which were small and did not exceed 50 ml in size. All of the samples, with the exception of the three cores, contained large quantities of modern roots which were mostly herbaceous.

The retent (residue) fractions consisting of the inorganic remains were collected and slowly air dried before being stack sieved using 4, 2, 1 and 0.3 mm sieves. The washovers (flots) were stored in water and refrigerated until required. All the samples were subsequently examined at magnifications of $\times 10$ and up to $\times 100$ where necessary to aid identification. Identifications were confirmed using modern reference material and seed atlases (Cappers *et al* 2006; Jacomet 2006; Tomlinson 1985; Smith 1980). Dr Allan Hall of the Department of Archaeology at the University of York kindly assisted with problematic identifications.

During the preliminary work carried out on the bulk samples collected during the 2008 and 2009 seasons, it became clear that to fully comprehend the taphonomy of the floor deposits, a new sampling strategy had to be implemented. Consequently kubiena and

block samples were taken during the 2010 season for environmental analyses. The kubienas and monoliths were first visually examined and then mechanically teased apart to deconstruct the sequence of the matrix. Two monoliths and three kubienas were subjected to this form of examination and these results are incorporated into the main discussion along with the results obtained from the bulk samples.

The tabulated results for the macroplant, charcoal and burnt bone can be found in the site archive.

Appendix 2. Cults Loch 3; the insect remains

Enid Allison

Methods

Most of the samples submitted for examination had volumes of 2 litres, the single exception being a 'spot' sample consisting of 150–200 g of sediment collected specifically to investigate its insect content. The 2 litre samples were received having been wet-sieved with flotation by AOC staff, and both flot and retent had been collected on 0.25 mm mesh. Once received, each sample was washed to 0.3 mm and processed by paraffin flotation to extract insect remains following the methods of Kenward *et al* (1980). The spot sample consisted of very compacted peaty sediment which was frozen and thawed out twice before processing in an attempt to minimise damage to delicate organic remains (Vandorpe & Jacomet 2007).

For analysis, beetles (Coleoptera) and bugs (Hemiptera) were removed from the paraffin flots onto moist filter paper for identification using a low-power zoom microscope ($\times 7$ – $\times 45$). The state of preservation of remains was recorded using the system of Kenward and Large (1998) where fragmentation and erosion are scored on a scale from 0.5 (superb) to 5.5 (extremely decayed or fragmented). Identification was by comparison with modern insect material and reference to standard published works. Minimum numbers of individuals and taxa of beetles and bugs were recorded, and taxa were divided into broad ecological groups following Kenward *et al* (1986) and Kenward (1997) (see [Table A2.2](#) for groups used). For interpretation aquatic beetles and bugs were subtracted from the rest to provide data on terrestrial ecology. Waterside and marginal taxa were included among terrestrial forms. Decomposer beetles dominated most of the assemblages and the diversity (species richness) of this component in each sample was measured using the index of diversity (alpha) of Fisher *et al* (1943). Values of alpha for the decomposer component (α RT) and associated standard errors (SE) were calculated using a purpose-written Pascal program originally created at the University of York in 1992 by Harry Kenward and subsequently adapted to run on a personal computer by John Carrott.

Nomenclature follows Duff (2008) for Coleoptera, Nau (2006) for

Heteroptera, and Le Quesne and Payne (1981) for Homoptera, Auchenorrhyncha. The abundance of other invertebrates in the flots was recorded subjectively on a three point scale as present, common or abundant. The paraffin flots are currently stored in jars of industrial methylated spirits (IMS).

Notes on identification and nomenclature

Carpelimus bilineatus: This species has regularly been identified as one of the commoner beetle taxa occurring among occupation waste on archaeological sites. A closely similar species *C. erichsoni* has recently been distinguished on male genitalia and it appears that the two species have long been confused (Lott 2009). Which of them archaeological records encompass is currently open to question. Specimens referable to the species pair were common in the deposits at Cults Loch. For brevity and continuity with existing archaeological records these are referred to below as *C. bilineatus* agg.

Geotrupes: The genus of scarabaeid dung beetles formerly known as *Geotrupes* (Kloet & Hincks 1964–77) is currently split into three separate genera (Duff 2008). It was not possible to closely identify the fragmentary remains in the Cults Loch assemblages. In the report and tables below they are referred to simply as *Geotrupes* in the broad sense of Kloet and Hincks.

Oulimnius sp.: Members of this genus are closely similar and can be reliably separated only on genitalia. It is likely, based on the form of the pronotum (Holland 1972), that many of those represented here were *O. tuberculatus*.

Latridius minutus group: A compound taxon was used since distinguishing the several species in the genus is difficult without the presence of genitalia, and the ecological implications are the same.

Anobium spp.: Small numbers of individuals were recorded from some of the samples. The common woodworm beetle *Anobium punctatum* was positively identified from two samples, and *A. fulvicorne* and *A. inexpectatum* from one sample. The remainder could not be confidently identified to species.

Results

Beetle and bug remains were common or abundant in the samples, their concentration ranging from 57–220 individuals per litre of sediment (see [Table A2.1](#)). Their Appendices state of preservation varied from good to poor between different deposits and often within individual samples, particularly with regard to erosion. In some

samples erosion had advanced to the point that many beetle and bug sclerites had become completely or partially pale, thinned and soft. This was offset by the fact that remains were usually not too badly fragmented and it was therefore still possible to identify most of the material to a useful taxonomic level.

Fly puparia were common in most of the samples, and although they were not systematically identified it was observed that many or most of those recorded in particular samples were of house fly (*Musca domestica*). Analysis focused on beetles and bugs and the assemblages recovered from the various parts of the structural sequence are described below. Archaeological information for each of the deposits is shown in square brackets.

Details of individual samples, including scores for fragmentation and erosion of insect sclerites, are shown in Table A2.2 where ecological codes used are explained. Host plants of strongly plant-associated species are shown in Table A2.3, and lists of invertebrate taxa recovered from each sample in Table A2.4. The main statistics of the assemblages are presented in Tables A2.5 and A2.6. Percentages given in the main text of the report for the abundance of particular ecological groups have been calculated from the numbers of individuals within that group, unless otherwise stated.

Table A2.1. Cults Loch Promontory, Castle Kennedy: Details of the samples examined for insect remains.

Context	Sample volume (litres)	Paraffin flot vol (ml)	MNI beetles & bugs	Beetles & bugs/litre	Fragmentation (F)	Erosion (E)
207	2	20	242	121	F 2–4 (mode 2.5)	E 2.5–4 (mode 3)
210	2	30	349	175	F 2–3 (mode 2.5)	E 2.5–4.5 (mode 4)
212	2	30	131	66	F 2–3	E 3–4.5 (mode 4)
510	0.2	60	44	220	F 2–3	E 3–3.5
512	2	30	135	68	F 2–3 (mode 2.5)	E 3–4.5 (mode 3.5)
513	2	30	214	107	F 2–5 (mode 3)	E 3–5 (mode 4)
515	2	30	360	180	F 2–3 (mode 2.5)	E 2.5–3.5 (mode 3)
604	2	30	141	71	F 1.5–5 (mode 2.5)	E 2.5–4.5 (mode 3.5)
616	2	40	259	130	F 1.5–2.5 (mode 2)	E 2–4.5 (modes 2.5, 4)
622	2	50	114	57	F 2–3.5 (mode 3)	E 2.5–3.5 (mode 3)
629	2	30	135	68	F 2–3	E 3–4.5 (mode 3.5)
633	2	60	138	69	F 2–3	E 2–3.5 (mode 2.5)
634	2	60	126	63	F 2.5–3 (mode 2.5)	E 2.5–3.5 (mode 3)
635	2	40	162	81	F 2–2.5 (mode 2.5)	E 2.5–3.5 (mode 2.5)

Scores for fragmentation and erosion of beetle and bug sclerites follow Kenward and Large (1998) where values range between 0.5 (superb condition) to 5.5 (extremely decayed or fragmented)

Table A2.2: Ecological groups used in analysis following Kenward et al (1986) and Kenward (1997)

- d – damp ground or waterside taxa
- g – grain-associated taxa

l – wood-associated taxa
 m – moorland taxa
 oa – certain outdoor taxa (unable to live and breed either within buildings or in accumulations of organic material)
 ob – probable outdoor taxa
 p – strongly plant-associated taxa
 rd – dry decomposers
 rf – foul decomposers
 rt – generalised decomposers
 RT – total decomposers (rd + rf + rt)
 ss – strong synanthropes (very rare in natural habitats)
 st – typical synanthropes (typically present in man-made habitats but capable of living in natural situations)
 sf – facultative synanthropes (found in man-made and natural habitats)
 S – total synanthropes (ss + st + sf)
 w – aquatic taxa
 u – uncoded taxa

Table A2.3. Habitats and food preferences of strongly plant-associated beetles and bugs

Species	Habitats and food and preferences
<i>Trapezonotus</i> sp.	Found on drier soils
<i>Macrodera micropterum</i>	On heathland, eggs are stuck to stems of heath (<i>Erica</i>)
<i>Stygnocoris sabulosus</i>	On dry light soils, generally where good vegetation cover. In W Britain generally found under heather
<i>Scolopostethus decoratus</i>	On heathland, associated with heathers (<i>Calluna</i> & <i>Erica</i>)
<i>Ulopa reticulata</i>	Associated with heathers (<i>Calluna</i> & <i>Erica</i>)
<i>Oncopsis</i> sp.	Genus found on several trees & shrubs
<i>Conomelus anceps</i>	Common on rushes (<i>Juncus</i>)
<i>Livia juncorum</i>	Wet meadows on rushes

<i>Strophingia ericae</i>	(<i>Juncus</i>) On heathers (<i>Calluna</i> and <i>Erica</i>)
<i>Lebia ?chlorocephala</i>	Open grassland, especially where grass forms tussocks. Larvae are ectoparasitoids of leaf beetle (Chrysomelidae) larvae & pupae
<i>Serica brunnea</i>	On light soils, sometimes under moss on downs or sheltering in rotten stumps. Larvae feed at roots of turf
<i>Phyllopertha horticola</i>	Usually on poor quality pasture on light soils. Larvae feed at roots of turf
<i>Dascillus cervinus</i>	Adults found on flowers and bushes. Larvae feed at roots of short vegetation
<i>Byrrhus</i> sp	Both adults & larvae feed on mosses
<i>Denticollis linearis</i>	Typically found in woodland or scrub. Larvae live in rotten wood
<i>Plateumaris discolor</i>	Adults usually found on sedges (<i>Carex</i>)
<i>Plateumaris</i> or <i>Donacia</i> spp	On various waterside & emergent vegetation
<i>Prasocuris phellandrii</i>	Adults feed on marsh marigold (<i>Caltha palustris</i>) & other Ranunculaceae. Can be found on leaves of other marginal plants inc. waterside umbellifers
<i>Longitarsus</i> spp.	Members of genus found on various herbaceous plants, especially Boraginaceae, Scrophulariaceae & Labiatae
<i>Chaetocnema arida</i> group	On various grasses, sedges (<i>Carex</i>) and rushes (<i>Juncus</i>)
<i>Chaetocnema concinna</i>	Usually on members of knotweed family (Polygonaceae) inc. <i>Polygonum</i>

Perapion curtirostre

Notaris acridulus

Micrelus ericae

Sitona spp.

& docks (*Rumex*)

On all 3 subgenera of docks
(*Rumex*)

On semi-aquatic grasses. Reed
sweet-grass (*Glyceria maxima*)
is common host in Continental
Europe

On heathers (*Calluna* and
Erica)

On Papilionaceae

Very eurytopic taxa and species from dead and rotten wood habitats have been excluded. Main sources: Cox (2007), Harde (1984), Hodkinson and White (1979), Jessop (1986), Luff (2007), Morris (1990, 2002, 2008), Southwood and Leston (1959)

Table A2.4. Cults Loch Promontory Crannog: Insect and other invertebrates recorded from the samples

Context	207	210	212	510	512	513	515	604	616	622	629	633	634	635
Sample volume (litres)	2	2	2	0.2	2	2	2	2	2	2	2	2	2	2
Oligoneura sp. (scutiform egg capsules)	+	–	–	–	–	–	–	–	–	–	–	–	–	–
Cladocera spp. (eggs)	+	–	+	–	+	–	+	–	–	+	–	–	–	–
Dermoptera sp. [a]	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bovicola caprea (Guth)	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bovicola erici (Scharnk)	–	–	–	–	–	–	–	–	–	–	–	–	–	+
Trapezocleus sp. [oa-p]	–	–	–	–	–	–	–	–	1	–	–	–	–	–
Macrodon micropterus (Cutis) [oa-p+u]	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Stygocoris subdus (Schilling) [oa-p]	–	–	–	–	–	1	1	–	19	–	–	1	–	–
Scolopocleus decoratus (Tah) [oa-p+u]	–	–	–	–	–	–	1	–	6	–	–	–	–	–
Scolopocleus sp. indet. [oa-p]	–	–	–	–	1	–	–	–	–	–	–	–	–	–
Lygaeidae spp. [oa-p]	–	–	–	–	–	2	–	–	–	–	–	–	–	1
Ystocoris confusus (Fabricius) [rd]	–	–	–	–	–	–	–	–	–	–	–	1	–	1
Saldidae sp. [oa-d]	–	–	1	–	–	–	1	–	1	–	–	–	–	–
Coccidae sp(p). [oa-w]	1	1	–	–	3	–	1	–	–	10	1	3	1	1
Cortidae sp. (nymphs) [oa-w]	–	–	–	–	–	–	–	–	–	+	–	–	–	–
Heteroptera spp. [a]	–	–	1	–	–	1	–	–	–	–	–	1	–	–
Uroga ruficollis (Fabricius) [oa-p+u]	–	–	–	–	–	–	–	–	5	–	–	–	–	–
Oncopeltus sp. [oa-p]	–	–	–	–	–	–	–	–	–	–	–	–	–	1
Coreidae anceps Germar [oa-p]	–	–	–	–	3	–	3	2	1	–	3	2	3	3
Delphacidae spp. [oa-p]	1	1	1	–	1	3	2	–	–	1	–	2	6	–
Auchenorhyncha spp. [oa-p]	–	–	–	–	–	1	2	–	4	–	1	–	–	–
Lucia juncorum (Leston) [oa-p]	–	–	–	–	1	–	–	–	15	–	–	–	–	–
Syrphingia ericae (Cutis) [oa-p]	–	–	–	–	–	–	1	–	–	–	–	–	–	–
Syrphingia ericae (Cutis) (nymphs) [oa-p]	–	–	–	–	–	–	–	–	++	–	–	–	–	+
Psyllidae sp. Aphidius [oa-p]	–	–	–	–	–	–	–	–	–	+	–	–	–	–
Coccidae spp.	–	–	–	–	–	–	–	–	1	–	1	–	–	1
Context	207	210	212	510	512	513	515	604	616	622	629	633	634	635
Trichoptera sp. (adults)	–	–	–	–	–	–	+	–	–	–	–	–	–	–
Trichoptera sp. (larval fragments and cases)	–	–	1	–	1	–	1	–	–	1	1	1	1	–
Ethecidae sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Diptera spp. (adults)	–	–	–	–	–	–	–	–	–	–	–	+	–	+
Diptera spp. (nymphs)	++	++	–	+++	++	–	++	+	++	+	++	++	+++	+++
Pulex irritans 1 immatus [sc]	–	1	–	–	–	–	1	–	–	–	1	–	–	1
Spiloptera sp. indet. (body segments)	1	–	1	–	–	–	–	–	–	–	1	–	–	–
Formicidae spp.	–	–	–	–	–	–	+	–	+	–	–	+	–	–
Hymenoptera Parasitica spp.	+	++	+	–	–	–	++	–	++	–	+	+	–	+
Hymenoptera Aculeata spp.	–	1	–	–	1	–	–	–	–	1	1	1	–	–
Crius sp. [oa-w]	2	1	1	–	1	1	2	1	1	–	1	–	–	–
Haliphus sp. [oa-w]	–	–	–	–	–	1	–	–	–	–	–	–	–	–
Agabus bipunctatus (Linnaeus) [oa-w]	1	–	–	–	–	1	–	–	–	–	–	–	–	–
Agabus or Hybris spp. [oa-w]	1	1	1	–	2	1	–	–	–	–	1	–	–	–
Tychiusinae spp. [oa-w]	–	–	–	–	–	5	3	–	–	–	–	1	–	–
Dytiscidae spp. and sp. indet. [oa-w]	–	–	–	–	–	1	1	–	–	–	–	–	–	–
Carabus sp. [oa]	–	–	–	–	–	–	–	–	–	–	–	1	1	–
Dytiscinae globosus (Herbst) [oa]	–	–	–	–	–	1	1	1	–	–	–	–	1	–
Trechus obsoletus or quadristriatus [oa]	–	1	1	–	–	–	–	–	–	1	–	–	–	–

<i>Trechus</i> sp. [ab]	1	–	–	–	–	–	–	1	–	–	–	–	–	–
<i>Trechobius nactus</i> (Fierlet) [u]	2	–	–	–	–	–	2	–	–	–	–	–	–	–
<i>Bembidion</i> (<i>Phila</i>) <i>oktanum</i> Audinet-Serville [oa]	–	–	–	–	–	–	1	1	–	–	–	–	–	–
<i>Bembidion</i> (<i>Ptilocinetus</i>) sp. [oa]	–	1	–	–	–	–	1	–	–	–	–	–	–	–
<i>Bembidion</i> spp. [oa]	–	1	–	–	–	–	–	1	–	–	1	–	–	–
<i>Pterostichus niger</i> (Feytaud) [oa-d]	–	–	–	–	–	–	–	2	–	–	–	–	–	–
<i>Pterostichus nigrita ex rheticus</i> [oa-d]	–	–	–	–	–	–	1	1	–	–	–	–	–	–
<i>Pterostichus</i> (<i>Pseudonatus</i>) sp. [oa-d]	–	–	–	–	–	–	–	–	–	–	1	1	–	–
<i>Pterostichus diligens</i> (Sturm) [oa-d]	–	1	–	–	–	–	–	2	1	7	1	–	–	–
<i>Pterostichus strenuus</i> (Pauzeur) [oa]	–	–	–	–	–	–	–	–	–	–	1	–	–	–
<i>Pterostichus</i> sp. [oa]	–	1	–	–	–	–	–	1	–	–	–	–	–	–
<i>Abax parallelipipedus</i> (Piller & Mitterpacher) [ab]	1	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Calathus fuscipes</i> (Geene) [oa]	–	–	–	–	–	–	–	2	–	–	–	–	–	–
Context														
<i>Calathus</i> spp. [oa]	207	210	212	510	512	513	515	604	616	622	629	633	634	635
<i>Paranichus albidus</i> (Fabricius) [oa]	1	–	–	–	–	1	1	–	–	–	1	–	–	–
<i>Agonum</i> s. l. <i>fuliginosum</i> (Pauzeur) [oa-d]	–	1	–	–	–	3	–	–	–	–	1	–	–	–
<i>Agonum</i> sp. [oa]	–	–	–	–	–	1	2	–	–	–	–	–	–	–
<i>Anares</i> sp(p). [oa]	1	–	–	–	–	–	–	–	–	1	–	–	–	–
<i>Lebia</i> <i>teilaroccephala</i> (Hoffmann) [oa]	–	–	–	–	–	1	–	–	–	–	–	–	–	–
<i>Cuculidius</i> spp. [ab]	–	–	–	–	–	3	–	2	6	6	1	1	–	–
<i>Heliophorus</i> spp. [oa-w]	2	4	2	–	–	1	3	5	2	4	1	3	–	3
<i>Anacaea globulata</i> (Paykull) [oa-w]	–	–	–	–	–	–	–	–	–	–	1	–	–	–
<i>Anacaea</i> <i>globulata</i> (Paykull) [oa-w]	1	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Anacaea globulata ex laticata</i> [oa-w]	–	–	1	–	–	–	–	–	–	–	–	1	–	–
<i>Chastartria</i> sp. [oa-d]	–	–	–	–	–	1	–	–	1	–	–	–	–	–
<i>Hydrotus fascipes</i> (Linnaeus) [oa-w]	–	–	–	–	–	1	1	–	–	–	–	–	–	–
<i>Leccobius</i> sp. [oa-w]	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Ulyssipholus</i> spp. and spp. indet. [oa-w]	1	1	–	–	–	1	–	–	1	1	–	–	–	–
<i>Ceryon boenorrhoidalis</i> (Fabricius) [rt-sf]	–	–	1	–	–	–	1	–	–	–	–	–	–	–
<i>Ceryon melanoccephalus</i> (Linnaeus) [rt-sf]	1	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Ceryon pygmaeus</i> (Müller) [rt-sf]	1	–	–	–	–	–	–	–	1	–	–	–	–	–
<i>Ceryon armatus</i> (Marsham) [rt-sf]	–	–	1	–	–	–	3	–	–	1	–	–	–	–
<i>Ceryon angusticollis</i> (Linnaeus) [rt-sf]	–	3	1	–	1	–	–	1	–	–	2	2	2	–
<i>Ceryon ?undulatus</i> (Linnaeus) [rt-sf]	–	–	–	–	–	1	–	–	–	–	–	–	–	–
<i>Ceryon analis</i> (Paykull) [rt-sf]	20	34	16	10	18	12	34	11	1	16	15	26	7	12
<i>Ceryon</i> <i>tonalis</i> (Paykull) [rt-sf]	–	7	2	–	–	5	3	–	–	–	–	–	–	–
<i>Ceryon acutatus</i> (Peysseler) [oa-d]	3	2	2	1	1	2	–	–	–	–	–	–	–	–
<i>Ceryon</i> spp. and spp. indet. [u]	5	–	1	1	–	1	1	1	1	–	3	–	3	–
<i>Megasternus concoloratus</i> (Marsham) [rt]	1	1	1	–	–	–	–	–	1	1	–	1	1	1
<i>Cryptopellus eximius</i> (Fabricius) [rt-v]	1	–	–	–	–	–	–	–	2	–	–	–	–	–
<i>Ulyssipholus</i> sp. [u]	–	–	–	–	–	–	–	–	–	–	–	–	2	–
<i>Actina nigricornis</i> (Hoffmann) [rt-st]	1	–	–	1	–	–	3	–	–	–	–	–	–	–
<i>Oothophilus strabus</i> (Fosberg) [rt]	–	–	–	–	–	–	1	–	–	–	–	–	1	–
<i>Usteterna</i> sp(p). [rt]	1	–	–	–	–	1	–	–	–	–	–	–	–	–
<i>Hydrotus nigrita</i> Geierl [oa-p]	–	–	1	–	–	–	–	–	–	–	–	–	–	–
<i>Hydrotus testaceus</i> Curtis [oa-w]	1	–	–	–	1	–	1	1	–	1	–	–	–	–
Context														
<i>Hydrotus</i> spp. [oa-w]	207	210	212	510	512	513	515	604	616	622	629	633	634	635
<i>Linneobius</i> sp(p). [oa-w]	1	3	1	–	3	1	2	–	–	2	1	1	1	–
Context														
<i>Ochthebius</i> sp. [oa-w]	–	–	–	–	–	–	–	–	–	1	–	–	–	–
<i>Pronichus</i> sp(p). [rt]	7	20	1	1	13	12	1	2	2	–	1	1	1	1
<i>Acrotrichus</i> spp. [rt]	8	4	5	1	1	7	1	1	–	2	2	4	3	7
<i>Eubolia</i> sp. [u]	1	25	1	–	–	1	–	–	–	1	1	1	–	2
<i>Scydmaecinus</i> sp(p). [u]	–	–	–	–	–	–	1	1	4	–	–	–	1	–
<i>Silpha atrata</i> Linnaeus [u]	1	–	–	–	–	1	–	–	–	–	–	–	–	–
? <i>Silphidae</i> sp(p). [u]	–	–	–	–	–	–	2	–	–	–	–	–	–	–
<i>Acheta crenata</i> (Fabricius) [oa]	–	–	1	–	–	–	1	–	5	–	–	–	–	–
<i>Anobium unicolor</i> (Marsham) [oa]	–	–	–	–	–	–	–	–	–	–	–	–	1	–
<i>Lasius scutis</i> ssp. <i>heeri</i> Fausel [oa-d]	1	2	3	–	–	2	2	–	–	–	–	–	–	–
<i>Oloperion cf piceum</i> [oa]	1	1	–	–	–	–	2	–	14	–	–	–	–	–
<i>Oloperion</i> sp. and spp. indet. [oa]	–	–	–	–	–	1	–	–	–	–	1	–	–	–
<i>Oonitum</i> spp. [rt]	–	–	–	–	–	–	1	–	–	–	–	–	–	–
<i>Xylodromus concoloratus</i> (Marsham) [rt-st]	1	3	–	–	2	4	2	1	1	–	1	–	–	–
<i>Onalutae</i> spp. [u]	2	–	–	1	1	2	1	3	–	1	2	–	–	1
<i>Microptus clypeatus</i> (Müller) [rt]	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Archaeopallus testaceus</i> (Curtis) [rt]	–	–	–	–	–	–	–	–	–	–	–	–	–	1
<i>Micropterus fulvus</i> Eschschon [rt]	1	–	–	–	–	1	3	–	–	–	1	–	–	–
<i>Micropterus staphylinoides</i> (Marsham) [rt]	2	2	–	–	1	–	–	–	–	–	–	–	–	–
<i>Micropterus</i> sp. indet. [rt]	–	–	–	–	–	–	1	–	–	–	–	–	–	–
<i>Micropterus</i> sp. [rt]	–	–	–	–	–	–	–	–	–	–	–	1	–	–
<i>Ancistrus nuchalis</i> (Aubé) [u]	–	1	–	–	–	–	–	–	–	–	–	–	–	–
<i>Psalidium heisei</i> Herbst [u]	–	–	–	–	–	–	–	–	6	–	–	–	–	–
<i>Psalidium</i> spp. [u]	4	2	1	–	–	–	1	2	4	–	–	1	1	–
<i>Mycetoporus</i> spp. [u]	1	–	–	–	–	–	–	–	2	–	–	–	–	–
<i>Seydipollus</i> sp. [u]	–	–	–	–	–	–	–	–	1	–	–	–	–	–
<i>Tachinus</i> sp. [u]	–	–	–	1	–	1	–	–	–	–	–	1	1	–
<i>Tachyporus</i> sp. [u]	–	–	1	–	–	1	–	–	2	–	–	–	–	–
<i>Tachyporus</i> sp. ? <i>Lerdion</i> sp. [u]	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Cecobius obscurus</i> (Graenicher) [rt-sf]	4	12	1	–	6	6	7	8	1	2	4	–	1	1
Context														
<i>Coritola</i> s. l. <i>fulvipes</i> sp. [rt-sf]	207	210	212	510	512	513	515	604	616	622	629	633	634	635
<i>Fuliginea</i> sp. [rt-sf]	–	–	–	–	–	–	–	–	–	–	1	2	–	1
<i>Cyphus</i> sp. [u]	1	–	–	–	–	–	–	1	–	–	–	–	–	–
<i>Dranilia canalliculata</i> (Fabricius) [u]	–	–	–	–	–	–	–	–	3	–	–	–	–	–
<i>Cteniscus similis</i> (Maurachius) [rt-sf]	–	1	–	1	2	–	–	–	–	–	–	–	–	–
<i>Alcedrinus</i> spp. [u]	7	32	4	2	5	13	17	8	14	8	7	12	17	20
<i>Anotinus stibidatus</i> (Graenicher) [rt-d]	–	–	–	–	–	–	–	–	–	–	–	1	–	–
<i>Anotinus rugosus</i> (Fabricius) [rt]	1	1	–	–	–	1	–	–	–	–	1	–	–	–
<i>Anotinus</i> <i>retrocurvatus</i> group [rt]	–	–	–	–	–	–	–	–	1	–	–	–	–	1
<i>Ooetulus sculptus</i> [rt-sf]	7	5	21	2	2	9	51	2	3	2	4	8	7	–
<i>Planatulus crenatus</i> (Foucaud) [rt]	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Carpetinus bethunae</i> ssp. <i>Stiphicus</i> [rt-sf]	20	59	14	11	9	7	33	18	5	7	14	13	15	4
<i>Carpetinus</i> spp. [u]	–	–	–	1	2	–	9	–	–	–	2	1	1	1
<i>Stenus</i> spp. [rt]	10	6	7	–	3	2	4	5	15	3	4	4	7	6
<i>Lathrobium</i> spp. [u]	3	–	–	–	–	1	1	1	14	2	1	1	–	–
<i>Ocithophallus franciscanus</i> (Paykull) [oa-d]	–	–	–	–	–	–	–	–	3	–	–	–	–	–
<i>Rugilus</i> sp. [rt]	1	2	1	–	1	1	2	4	–	1	–	–	–	–
<i>Psephenus</i> sp. [u]	–	–	–	–	–	–	–	–	17	–	–	–	–	1
<i>Otilus subuliferus</i> Stiphicus [rt]	–	–	–	–	–	–	–	–	–	–	–	–	–	–
<i>Otilus</i> sp. [rt]	–	–	–	–	–	1	–	–	–	–	–	–	–	–

different ecological groups, with percentages rounded up to the nearest whole number

Context	207	210	212	510	512	513	515	604	616	622	629	633	634	635
Number of terrestrial individuals	224	331	123	44	123	190	332	132	254	94	120	130	116	161
Number of terrestrial taxa	89	78	57	21	50	84	110	59	84	58	62	59	59	83
Number of RT individuals	127	216	80	34	88	113	213	85	62	56	70	82	59	82
% RT individuals	57%	65%	65%	77%	72%	69%	64%	64%	24%	60%	58%	63%	51%	51%
Number of RT taxa	32	29	23	12	24	27	37	21	21	24	24	25	22	29
% RT taxa	36%	37%	40%	57%	48%	32%	34%	39%	23%	41%	39%	47%	37%	35%
Number of rd individuals	13	41	6	2	10	19	13	9	5	8	10	6	6	21
% rd individuals	6%	12%	5%	5%	8%	10%	4%	7%	1%	9%	8%	5%	5%	13%
Number of rd taxa	4	5	3	2	3	5	6	5	2	4	4	4	4	9
% rd taxa	5%	6%	5%	10%	6%	6%	6%	9%	2%	7%	7%	7%	7%	11%
Number of rf individuals	27	8	7	1	8	16	23	7	11	7	7	6	10	6
% rf individuals	12%	2%	6%	9%	7%	8%	7%	5%	4%	8%	6%	5%	9%	4%
Number of rf taxa	7	5	6	2	7	4	7	5	6	6	5	4	6	5
% rf taxa	8%	6%	11%	10%	14%	5%	6%	9%	7%	10%	8%	7%	10%	6%
Number of rt individuals	87	167	67	28	70	78	177	69	48	41	53	70	43	55
% rt individuals	39%	51%	55%	61%	57%	41%	53%	52%	19%	41%	41%	51%	37%	31%
Number of rt taxa	21	19	11	8	11	18	24	13	13	14	15	17	12	15
% rt taxa	24%	24%	23%	38%	28%	21%	22%	22%	16%	24%	24%	29%	20%	18%
%rd/RT individuals	10%	10%	8%	6%	11%	17%	6%	11%	5%	14%	14%	7%	10%	26%
%rt/RT individuals	21%	4%	9%	12%	9%	14%	11%	8%	18%	13%	10%	7%	17%	7%
%rt/RT individuals	69%	77%	84%	82%	80%	69%	83%	81%	77%	73%	76%	85%	73%	67%
Diversity (alpha) RT	14	9	11	7	11	11	13	10	11	16	13	12	13	16
Standard error of alpha RT	2	1	2	2	2	2	1	2	2	4	2	2	3	3
Context	207	210	212	510	512	513	515	604	616	622	629	633	634	635
Number of g individuals	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% g individuals	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Number of g taxa	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% g taxa	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Number of l individuals	0	2	0	0	0	3	4	1	0	1	0	0	0	4
% l individuals	0%	1%	0%	0%	0%	2%	1%	1%	0%	1%	0%	0%	0%	3%
Number of l taxa	0	2	0	0	0	2	4	1	0	1	0	0	0	3
% l taxa	0%	3%	0%	0%	0%	2%	4%	2%	0%	2%	0%	0%	0%	4%
Number of d individuals	15	9	8	1	2	12	9	2	15	3	3	3	0	1
% d individuals	7%	3%	7%	2%	2%	6%	3%	2%	6%	3%	3%	2%	0%	1%
Number of d taxa	7	7	5	1	2	8	6	2	6	3	3	3	0	1
% d taxa	8%	9%	9%	5%	4%	10%	6%	3%	7%	5%	5%	5%	0%	1%
Number of p individuals	17	10	6	0	9	16	32	7	73	3	14	8	11	20
% p individuals	8%	3%	5%	0%	7%	8%	10%	5%	29%	3%	12%	6%	10%	12%
Number of p taxa	10	8	5	0	7	12	18	5	18	3	11	7	9	13
% p taxa	11%	10%	9%	0%	14%	14%	16%	9%	21%	5%	18%	12%	15%	16%
Number of m individuals	0	0	0	0	0	0	4	0	40	0	0	0	0	1
% m individuals	0%	0%	0%	0%	0%	0%	1%	0%	16%	0%	0%	0%	0%	1%
Number of m taxa	0	0	0	0	0	0	3	0	5	0	0	0	0	1
% m taxa	0%	0%	0%	0%	0%	0%	3%	0%	6%	0%	0%	0%	0%	1%
Number of oo individuals	46	24	15	1	14	40	60	13	110	12	20	15	25	23
% oo individuals	21%	7%	12%	2%	11%	21%	18%	10%	43%	13%	17%	12%	22%	14%
Number of oo taxa	26	20	11	1	12	25	34	11	27	12	16	13	15	16
% oo taxa	29%	26%	19%	5%	24%	30%	31%	19%	32%	21%	26%	22%	25%	19%
Number of oo-rob individuals	67	31	21	1	21	51	75	20	121	18	25	16	31	30
% oo-rob individuals	30%	9%	17%	2%	17%	27%	23%	15%	48%	19%	21%	12%	27%	19%
Number of oo-rob taxa	35	26	16	1	18	31	41	16	35	17	21	14	21	23
% oo-rob taxa	39%	33%	28%	5%	36%	37%	37%	27%	42%	29%	34%	24%	36%	28%
Context	207	210	212	510	512	513	515	604	616	622	629	633	634	635
Number of S individuals	73	168	64	31	64	68	175	67	29	42	55	65	47	60
% S individuals	33%	51%	52%	71%	52%	36%	53%	51%	11%	45%	46%	59%	41%	37%
Number of S taxa	16	16	12	9	14	15	21	13	10	13	12	12	14	16
% S taxa	18%	21%	21%	43%	28%	18%	19%	22%	12%	22%	19%	20%	24%	19%
Number of ss individuals	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% ss individuals	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Number of ss taxa	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% ss taxa	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Number of st individuals	25	53	30	9	24	30	91	26	9	11	20	19	19	28
% st individuals	11%	16%	24%	21%	20%	16%	27%	20%	4%	12%	17%	15%	16%	17%
Number of st taxa	10	10	6	6	8	7	9	7	3	5	7	6	6	4
% st taxa	11%	13%	11%	29%	16%	8%	8%	12%	6%	9%	11%	10%	10%	5%
Number of sf individuals	48	115	34	22	40	38	84	41	20	31	35	46	28	32
% sf individuals	21%	35%	28%	50%	33%	20%	25%	31%	8%	33%	29%	35%	24%	20%
Number of sf taxa	6	6	6	3	6	8	12	6	5	8	5	6	8	12
% sf taxa	7%	8%	11%	14%	12%	10%	11%	10%	6%	14%	8%	10%	14%	15%

Ecological groups are based on Kenward et al. (1986) and Kenward (1997) (see [Table 2](#) for codes used). Diversity of the decomposer component has been calculated following Fisher et al. (1943)

Sample No	Corect	C/F ratio	Course Mineral	Course Organic	Fine Organic	Pelofeatures	Microstructure	Course material arrangement	Groundmass fabric	Relict distribution	
			Quartz Feldspar Biotite Plagioclase Calcic amphibole	Olivine Pyroxene Olivine Chondrite	Legated Pseudomorph Olivine Chondrite	Amorphous black Amorphous yellow Amorphous Irregular brown Chondrite	Transect Organic Fe-matrix Extraneous Asbestos (fct) Pseudomorph	Leuticular	Broad angle parallel moderately expressed Banded distribution	Undifferentiated	Close porphyritic
K073: 1	108	20:80	++	+++	++	++	++	Leuticular	Broad angle parallel moderately expressed Banded distribution	Undifferentiated	Close porphyritic
K073:2	102	15:75	++	+++	++	++	++	Intergranular microaggregate	Random	Speckled	Open porphyritic
K081: 1	225	75:25	+++	+++	++	++	++	Channel and clausur	Random	Speckled	Close porphyritic
K081:2	225	75:25	+++	+++	++	++	+	Massive	Random	Speckled	Close porphyritic
K081:3	225	75:25	++	+++	++	++	++	Channel and clausur	Random	Speckled	Close porphyritic
K082:1	203	40:60	+++	+++	+++	+++	++	Crumb	Broad angle parallel moderately expressed random distribution	Undifferentiated	Close porphyritic
K082:2	203	65:35	++	+++	++	++	++	Intergranular microaggregate	AS orientation moderately expressed Weakly banded	Undifferentiated	Chitonic
K082:3	206	15:85	++	+++	+++	+++	++	Leuticular	Random	Speckled	Close porphyritic
K084: 1	212	40:60	++	+++	+++	+++	+	Channel and clausur	Broad angle parallel moderately expressed Banded distribution	Speckled	Open porphyritic

Sample No	Context	C/F ratio	Coarse Mineral	Coarse Organic	Fine Organic	Pseudomorphs	Microstructure	Coarse material arrangement	Groundmass b-fabric	Related distribution
			Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite
K08-1: 2	207	25/75	++	++	++	++	Channel and chamber	Parallel strongly expressed. Banded	Speckled	Double spaced porphyritic
K08-1: 3	208	30/70	+	++	++	++	Channel and chamber	Parallel weakly expressed. Banded	Speckled	Porphyritic
K092: 1 (inf 1)	503	30/70	++	++	++	++	Channel and chamber	Random	Speckled	Open porphyritic
K092: 1 (inf 2)	503	50/50	++	++	++	++	Channel and chamber	Random	Speckled	Open porphyritic
K092: 2	503	70/30	++	++	++	++	Channel and chamber	Random	Speckled	Open porphyritic
K092: 3	506	60/40	+	+	++	++	Vugly and moderately separated granular	Parallel moderately expressed. Banded	Faintly speckled	Open porphyritic
K093: 1	516	30/70	+	++	++	++	Weakly separated granular	Random	Undifferentiated	Porphyritic
K093: 2	503	50/50	++	++	++	++	Moderately separated granular	Random	Stipple speckled	Close porphyritic
K093: 3	503	30/70	+	++	++	++	Channel and chamber	Random	Undifferentiated	Open porphyritic

Sample No	Context	C/F ratio	Coarse Mineral	Coarse Organic	Fine Organic	Pseudomorphs	Microstructure	Coarse material arrangement	Groundmass b-fabric	Related distribution
			Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite	Quartz Feldspar Biotite Sphalerite Pyrite Carbonate Bauxite
M091B: 1 (MF1)	522	60/40	++	++	++	++	Channel and chamber	Parallel strongly expressed. Banded	Faintly speckled	Open porphyritic
M091B: 1 (MF2)	522	50/50	++	++	++	++	Channel and chamber	Parallel strongly expressed. Banded	Speckled	Open porphyritic
M091B: 2	511	75/25	++	++	++	++	Channel and chamber	Random	Undifferentiated	Open porphyritic
M092: 1	515	35/65	++	++	++	++	Channel and chamber	Random	Speckled	Open porphyritic
M092: 2	513	40/60	++	++	++	++	Channel and chamber, granular crumb	Random	Speckled	Open porphyritic
M092: 3	506	50/50	++	++	++	++	Granular crumb	Random	Speckled	Open porphyritic
K101: 1	620	65/35	++	++	++	++	Open channel and chamber	Random	Faintly speckled	Open porphyritic
K101: 2	616	40/60	+	++	++	++	Lenticular	Parallel moderately expressed. Banded	Undifferentiated	Porphyritic
K103: 1	636	50/50	++	++	++	++	Channel and chamber	Weakly parallel and banded	Undifferentiated	Open porphyritic

Sample No	Context	C/F ratio	Coarse Mineral	Coarse Organic	Fine Organic	Pedofeatures	Microstructure	Coarse material arrangement	Groundmass texture	Related distribution
			Quartz Feldspar Biotite Sillimanite Pyroxene Calcite, with bone	Lignified Vermiciform Organic residue Charred	Amorphous black Amorphous yellow reddish brown Charred	Trondromorphic Fe intensive Extramural Deposition (Fe) Pseudomorphs	Trondromorphic Organic Fe intensive Extramural Deposition (Fe) Pseudomorphs	moderately-developed sub-angular blocky microstructure	Parallel strongly expressed. Banded	Speckled Open porphyric
K103.2	636	30:70	++	++	++	++	++	Lenticular	Parallel strongly expressed. Banded	Speckled Open porphyric
K103.3.5	636	65:35	++	++	++	++	++	moderately-developed sub-angular blocky microstructure	Random	Undifferentiated Gefitic
K103.4	636	50:50	++	++	++	++	++	Visibly	Parallel moderately expressed. Weakly banded	Faintly speckled Gefitic
K103.6	620	70:30	++	++	++	++	++	Massive	Parallel weakly expressed. Banded	Faintly speckled Bridged gefitic
K104.1	643	50:50	++	++	++	++	++	Lenticular	Parallel strongly expressed. Banded	Undifferentiated Open porphyric
K104.2	620	75:25	++	++	++	++	++	weakly-developed sub-angular blocky	Random	Faintly Speckled Open porphyric
M101A: 1 (1a)	602	65:35	++	++	++	++	++	moderately-developed sub-angular blocky	Random	Faintly speckled Open Porphyric
M101A: 1 (1b)	602	75:25	++	++	++	++	++	moderately-developed sub-angular blocky	Random	Faintly speckled Close Porphyric
M101A: 2	601	70:30	++	++	++	++	++	Channel and chamber	45° moderately expressed. Random distribution	Speckled Open porphyric
Sample No	Context	C/F ratio	Coarse Mineral	Coarse Organic	Fine Organic	Pedofeatures	Microstructure	Coarse material arrangement	Groundmass texture	Related distribution
			Quartz Feldspar Biotite Sillimanite Pyroxene Calcite, with bone	Lignified Vermiciform Organic residue Charred	Amorphous black Amorphous yellow reddish brown Charred	Trondromorphic Fe intensive Extramural Deposition (Fe) Pseudomorphs	Trondromorphic Organic Fe intensive Extramural Deposition (Fe) Pseudomorphs	Weakly developed sub angular blocky	45° weakly expressed. Random distribution	Faintly speckled Open porphyric
M101A: 3	601	35:65	++	++	++	++	++	Weakly developed sub angular blocky	45° weakly expressed. Random distribution	Faintly speckled Open porphyric
M101B: 1	609	45:55	++	++	++	++	++	Moderately lenticular	Parallel moderately expressed. Banded	Faintly single speckled Porphyric
M101B: 2	602	70:30	++	++	++	++	++	moderately-developed sub-angular blocky	45° moderately expressed. Banded	Undifferentiated Close porphyric
M101C: 1	6227	60:40	++	++	++	++	++	Moderately lenticular	Parallel moderately expressed. Banded	Speckled Close porphyric
M101C: 2	621	75:25	++	++	++	++	++	Weakly lenticular	Parallel moderately expressed. Banded	Speckled Close porphyric
M101C: 3	609	60:40	++	++	++	++	++	moderately-developed sub-angular blocky	Parallel moderately expressed. Banded. Clustered mineral	Speckled (with isotropic bands) Porphyric
Key: ++trace ==Very few, +++ Few, ++++ Frequent/Common, +++++Dominant-Very Dominant										

Key: !=trace ==Very few, += Few, +++= Frequent/Common, ++++=Dominant/Very Dominant

Appendix 4. Analysis of the glass bead

Mary Davis

Analytical methods

Analysis was carried out using a CamScan Maxim 2040 scanning electron microscope (SEM) fitted with an Oxford Instruments energy-dispersive X-ray detector and ISIS spectrometer (EDS). Operating conditions employed a 30° take-off angle, a 20kV accelerating voltage, and the samples were analysed for 100 seconds livetime with a beam current which yielded a count rate of c 4000 counts per second when on a metallic cobalt standard.

The spectrometer was calibrated using pure elements, oxides and minerals; for lead, a leaded glass standard was used where high concentrations of PbO were present. Corning A-D (Brill 1999) and a range of commercial glass standards were used to evaluate accuracy and precision.

Sampling

The bead was sampled using the method devised by Bronk and Freestone (2001). This uses a diamond-coated file to score across a small section of the surface of the object to produce fine glass flakes. The procedure was originally assessed to be suitable for the classification of glass types and to allow useful conclusions to be drawn about raw materials, provenance and date, although not as accurately and precisely as for mounted and polished samples. (Bronk & Freestone 2001). Fragments for analysis were selected using close examination of both secondary (SEI) and back scattered electron images (BSEI) in the SEM, in order to select a flat, clean surface, not shadowed by other pieces, with a consistent atomic number and lack of surface abnormalities or corrosion. Three analyses were taken for each sample

As expected, using the flake method the overall percentage totals departed from 100% due to the variable geometry. As observed by Bronk and Freestone (op cit) the standard deviation for the flakes was slightly greater than that for polished samples; also as with the polished samples, the largest standard deviations were for sodium, possibly due to its volatility in the electron beam, and lead, antimony

and tin, probably due to uneven dispersal of these metal compounds within the glass matrix, especially when used as opacifiers. Analyses were normalised to totals of 100% so they could be compared to one another and to other analyses.

Results

The results are presented in [Table A4.1](#). The composition of both the blue glass and the white decoration indicate the glass is of a soda-lime-silica composition, using mineral soda as the flux (indicated by both magnesia and potash values at <1%). It is consistent with the composition of Iron Age and Roman glass which was manufactured in the eastern Mediterranean. The glass was probably coloured during a secondary phase, and then traded as coloured ingots. Both the manufacturing and colouring of glass involve very high temperatures, but beads could have been made and decorated using coloured glass at a relatively local level by the use of ‘lampwork’.

The blue bead is coloured with cobalt, and possibly opacified with calcium antimonate. Calcium antimonate was responsible for the white colour of the glass used for decoration.

Table A4.1. Glass bead analyses

<i>Cults Loch SF 19</i>	<i>Na₂O</i>	<i>MgO</i>	<i>Al₂O₃</i>	<i>SiO₂</i>	<i>P₂O₅</i>	<i>SO₂</i>	<i>Cl</i>	<i>K₂O</i>	<i>CaO</i>	<i>FeO</i>	<i>CoO</i>	<i>CuO</i>	<i>ZnO</i>	<i>Sb₂O₃</i>	<i>PbO</i>
Blue bead	16.5	0.6	2.4	64.6	0.1	0.2	1.0	0.9	7.1	0.9	0.1	0.3	0.1	0.7	4.6
White decoration	14.5	0.4	2.2	68.8	0.1	0.3	0.9	0.5	8.1	0.4	nd	0.2	nd	2.6	1.0

Appendix 5. Summary of finds from Wigtownshire Iron Age sites

Site	Context	Reference	Glass	Stone	Fe	CuA	MWD (non-fer)	Cermet / shale	Other	Details	Museum
Aird Quarry, Inch.	enclosure	Cook 2006							X	LBA pot, struck lithic	Allocation pending
Aryolland, Mochrum	enclosure	Cavers & Geddes 2010		x						Unfinished spindle whorl	Stranraer
Airnzoiland, Mochrum	craenog	Munro 1882, 112–5; PSAS 23, 148		x	x	x	x		x	Glass beads Stone: 13, fac. whetstones CuA: decorated mount 3 crucibles Other: shale x 3, antler 'beak' slag? struck lithics	NMS: X.HT 27-62
Barhapple, Old Luce	craenog	Munro 1882, 182–90		x			x	x	x	Stone: 3 whetstone, pounder/hammerstone, pounder/smoothen Wood: 2 logboat frags, paddle, wooden items (peg survives) Shale: 3 Lead ore lump	NMS: X.AK 98, X.HT 15-19, X.HT 64-7
Barlockhart, Old Luce	craenog	Munro 1882, 56, 247		x						Stone: 8: 2 rotary querns (bun, beehive), ring-pendant, 2 whorls, grinding stone, slate disc, polisher	NMS: X.BB 74-5 (only some published material is in museum)
Barnsnaite, Old Luce	craenog	Wilson 1873		x						2 hammerstones	Not located
Black Loch of Myrton, Glasserton	craenog	Maxwell 1889, 214, figs 18–19; PSAS 23, 148		x	x				X	1 Fe, MWD?; 'masses of corroded iron and vitreous slag' Stone: 16: inc. whetstone, 11 hammerstones	NMS: X.HT 68-83
Black Loch/Loch Inch-Cryndil, Inch	craenog	Munro 1882, 57–60		x		x	x		x	Glass bangle 1 Fe knife CuA: knife fitting, 'Med cast vessel rim F: Med bone comb	NMS: X.HT 10-14
Carghildown, Whithorn	promontory fort	Toolis 2007		x					X	Stone: 7 (saddle quern, 2 hammerstones, burnisher, polisher, worked stone, cut-marked stone) 3 lead beads	Stranraer 2010.5
Castle Loch, Mochrum	island settlement	Radford 1950	x						X	Glass: beads, R bead R pot	Private collection, Old Place of Mochrum

Site	Context	Reference	Glass	Stone	Fe	CuA	MWD (non-fer)	Cermet / shale	Other	Details	Museum
Chippemore, Hough, Mochrum	enclosure	Fiddes 1952		x						'limpet scoops'	
Craigmoreoch Loch, Old Luce	craenog	Truckell 1966, 67		x						1 hammerstone	Dumfries Museum (not confirmed)
Craenog Head, Kilmalden	broch	Dateson & Holmes 2006, 164				x				R coin: AE Commodus	Stranraer Museum
Crugaleton, Seobie	promontory fort	Ewart 1985, 64				x				Romano-British tapering bow brooch, deconted	Stranraer Museum
Cults Loch promontory, Inch	loch promontory	This paper		x	x			x	x	Glass bead Stone: 31: saddle querns, rubbing stones, cobble tools Wooden items 2 shale bangles Struck lithics	Allocation pending
Cults Loch enclosure, Inch	enclosure	This paper		x						Stone: 3: beehive quern upper (deliberately damaged), rotary lower, further 'quern fragment	Allocation pending
Dolly Bay, Kirkcubbin	promontory fort	Wilson 2001, 115		x						R melon head	Private owner (findspot adjacent to fort)
Durman's Island, Whitefield Loch, Old Luce	craenog	Cavers et al 2011		x	x			x		Glass bangles, R vessel glass Shale ring 2 hammerstones	NMS: X.HT 63 (shale); Stranraer Museum
Dowallton Loch, Seobie	craenog	Hunter 1994; Munro 1885, 77–106		x	x	x	x	x	x	Glass: x 9 (bangles, beads, R beads) Stone: x 5 (3 whetstones, 1 multifunction tool, 1 palette) Fe: 2 axe heads, hammer head, 2 vessel handles CuA: decor mount, 7 linch pin head, ring, sheet frag Wood: 4 logboats, paddle, 4 pegs, 3 wedges Other: FIA crucible, shale, amber bead, samian; iron smithing-hearth bottom; leather shoe	NMS: X.HU 2-70
Fox Plantation, Inch	open settlement	DES 1996, 29–30		x					x	Stone: c16, inc. 2 rotary quern fragments, pounders, whetstones, sharpening stone Shale roughout	Stranraer Museum
Mochermore, Old Luce	craenog?	Munro 1882, 56, 247		x						6: 3 perforated stones, multifunction cobble tool, smoother mortir, saddle quern rubber	NMS: X.AK 100, X.AM 14, X.AO 80-82, X.BA 50

Site	Context	Reference	Glass	Stone	Fe	CuA	MWD (non-fer)	Cermet / shale	Other	Details	Museum
Ravenstone Moss, Glasserton	craznog	Mowat 1996, 104						x		Wood: 5 or 6 paddles	NMS: X.IIU 14
Rispain, Whithorn	enclosure	Haggarty & Haggarty 1983	x	x	x	x			x	Glass: 2 blue fragments (lost) Stone: 8 in. ?weight fragment, ?gaming counter / whorl roughout, ?sharpening stone Fe: adze, tongs CuA: Enamelled mount Other: antlers (lost), human skulls, slag	NMS: X.GP 101-3.X. HH 979-80
Teroy, Inch	broch	Curle 1912		x	x	?			x	Stone: rotary quern upper Fe lump and 'particles of iron in extreme corrosion' R coarse ware, tycare	NMS: X.GA 958
Whiterook Quarry, Old Luce	open settlement	Gordon 2009		x			x		x	Stone: saddle quern, rubbing stone ?crucible LBA/EIA pot	Stranraer Museum 2012.14
Whithorn Priory	?	Hill 1997, 292-7	x			x			x	Glass bangles R coin - AE Constantius II or Constans Samian, R coarse ware	Stranraer Museum
Awhirk, Stoneykirk	deposit	Anderson 1938				x				Cauldron	NMS: X.DU 16
Balgreggan Quarry, Stoneykirk	coin hoard	Robertson 2000, no 1345				x				Late R coin hoard in R pot (latest coins are of Decentius, 350-3)	NMS: X.FR 566
Dalvaud / Dervaird Moss	deposit	Earwood 1993, 67, 272						x		Wooden cup, recorded in CANMORE (NX47SW 10) as from Mfmingafl parish; but NMAAS (1892, 324) records it as Glenluce, donated by Rev George Wilson; Dalvaud may well be a mis-print for Dervaird	NMS: X.ME 70
Dowalton Loch, Sorbie	deposit	Hunter 1994				x				R pattern	NMS: X.HU 1
Stranraer	coin hoard	Robertson 2000, no 1070				x				Late R coin hoard (including Constantine I, 307-337)	Stranraer Museum?
Kirkchrist, Pemmingshame	deposit	Maxwell 1889, 230, fig 55					x			Trough: 'several other objects'	NMS: X.SFA 8 / MP 210

Site	Context	Reference	Glass	Stone	Fe	CuA	MWD (non-fer)	Cermet / shale	Other	Details	Museum
Airrieolland, Mochrum (Selby Collection)	?site	Murray 2005		x						Stone: 4: anvil stone, indented stone, weight, pounder	Stranraer Museum
Barhullion, Glasserton	?site (hillfort)	Maxwell 1885, 53, 1889, 213-5		x		x				Stone: grooved maul / weight CuA: R snace: armlet	NMS: X.AK 158, X.DO 28
Carleton, Glasserton	?site (mine?)	Wilson 2001, 115			x	x				Stone: 4: 3 perforated stones (weights), smoothed stone CuA: ingot	NMS: X.DA 64, X.AO 67, X.AX 47, X.BG 90, X.BG 96
Luce Sands (summary)	?sites		x	x	?	x	x	x	x	See table 3	Various
Suelloch, Monreith	?site	Maxwell 1885, fig 36; Wilson 2001, 118				x				R Mercury figurine: mini-axe	NMS: X.FR 226
Ballobble, Mochrum	burial	Cormack 1995	x							Glass bangle	Stranraer Museum
Luce Sands, High Torrs	burial	Breeze & Ritchie 1980			x	x	x		x	Fe: finger ring with onyx intaglio, dish fragments, nails, L-binding, fragments CuA: small ring R pottery Other: crucible frag, slag	Glasgow ARCIIN 2143.[10]
Luce Sands	burial		x							Glass beads	Stranraer Museum 1945.454-459A

Italicised entries are stray finds from on or near the site. Abbreviations: CuA, copper alloy; Fe, iron; MWD, metal-working debris; non-ferr, non-ferrous; R, R; AE, copper alloy coin

Appendix 6. Stray finds of certain or likely Iron Age date from Wigtownshire

Appendix 6 lists stray finds certainly or most probably of Iron Age date from Wigtownshire. Roman coins from modern conurbations, and those with eastern mint-marks, are omitted as being most likely later introductions.

<i>Site</i>	<i>Reference</i>	<i>Object</i>	<i>Museum</i>
Auchtermee, Portpatrick Balcarry, Old Luce	Wilson 2001, 115 N Holmes, pers comm (publication forthcoming)	Roman coin – AE Augustus Roman coin – AE ?Trajan	? ?
Bamkirk, Penninghame Blairbui, Glasserton (Selby collection)	Mowat 1996, 12 Murray 2005	Logboat, bog butter 2 cobble tools: pounder & pounder/smoothen	? Stranraer
Boreland of Longcastle, Kirkcinner	Hunter 1994	Romano-British dragonesque brooch	Stranraer
Carsduban, Mochrum (Selby Collection)	Murray 2005	Cobble tool: circumferential grinder	Stranraer
Chapelheron, Whithorn Clayshant, Stoneykirk	Robertson 1961, 150 Penney 1975, 16, <i>Palace of History</i> 1911, 871 no 19 = Callander 1916, fig 13	Roman coin – AE Diva Faustina I Roman melon bead; repaired shale bangle	Stranraer ?
Drumbuoy, Old Luce Carlleston, Sertie Kirkmaiden parish	Wilson 2001, 115 Unpublished <i>PSAS</i> 23, 203, 220, 228– 229; Maxwell 1885, 36 fig 28	Roman coin – AE, ?Antoninus Pius Roman brooch (Thealby Mine type) Glass bead, Roman melon bead, shale bangle	? Dunfries NMS / ?
New Luce (from river) North Two Mark, Stoneykirk	MacDonald 1939, 243 <i>DES</i> 2009, 61	Roman coin – AE Constantius II Bun-shaped rotary quern	? Private owner
Penninghame Piltanton Portankill, Kirkmaiden	Wilson 1887, 193 McCaig 1955, 178–179 <i>DES</i> 1982, 9; Wilson 2001, 116	Roman melon bead ‘Canoe’ Glass bangle	? Stranraer Dunfries
Slatehough, Glasserton Stranraer Stranraer (or Twynholm; provenance insecure) Upper Barr, Penninghame Wigtownshire Anderson collection	Robertson 1971, 128 <i>PSAS</i> 13, 172–173 J Pickin, pers comm J Pickin, pers comm Guido 1978, 200	Roman coin – AE Gallienus, Tetricus II Decorated rotary quern upper Decorated rotary quern Shale bead or whorl Glass bead Stone: 28: includes anvil stone, 14 abraded haematite, pounder, weight; 6 rotary querns (5 bun, 1 beehive) CuA: LIA Colchester brooch; 2 rings (?bridle bit) Glass beads, wide range of shale Stone: 25: includes cobble tools, whetstones, pot lids, spindle whorls, indented stone, stone ball, perforated weight Glass: beads (cannot now be located) Shale: quantities	Glasgow NMS: X.BB 6 Stranraer 2007.33 Monreith House NMS: X.FJ 26 Stranraer
Mann Collection		Stone: 38 perforated stones, indented stones, whetstones, weights, cobble tools, 30 spindle whorls (probably not Iron Age)	Glasgow Stranraer
Selby Collection	Murray 2005	Stone: 25: includes stone beads, spindle whorls, lithomarge objects, stone ring, cobble tools, indented stones, weights Glass: dumb-bell toggle Shale: roughout, pendant	Stranraer
Stair Collection		45 coarse stone implements	Stranraer
Wigtownshire, various	NMAS 1892		NMS